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Via Facsimile # (916) 657-2388
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Re: Comments on the Statewide Program Draft Environmental Impact Report (DEIR) for General Waste Discharge Requirements for Biosolids Land Application.

Thank you for the opportunity to comment on the above matter. In addition to concerns about adverse impacts on the environment and public in general, the Central Delta Water Agency (CDWA) is particularly concerned about the impacts from the land application of biosolids on ground and surface waters which naturally flow into or eventually are discharged into the Sacramento/San Joaquin Delta. 21-1

With regard to the land application of biosolids, the CDWA has not suggested a total prohibition of land application, but rather, has advocated significantly more restrictive use than what the US EPA's 503 regulations currently allow. (U.S. Code of Federal Regulations, Title 40, Part 503). Given the conceded lack of an adequate scientific understanding of the full potential impacts from land application on public health and the environment, together with substantial scientific evidence demonstrating the clear potential for adverse impacts, the CDWA has been advocating and continues to advocate the prohibition of the land application of biosolids to areas that unreasonably and unnecessarily jeopardize the public and the environment. 21-2

Based on a review of the available scientific evidence, it is clear that the scientific uncertainty with regard to the potential risks of land application of biosolids is considerable to say the least. Given this tremendous gap in our current scientific understanding of the 21-3

environmental fate of the thousands of potential contaminants and pathogens present in biosolids, it is difficult to comprehend how one could conclude that the most environmentally superior alternative for disposal of biosolids is to scatter them all over the state, much less on our state's limited and scarce prime farmland. No where in the EIR does the EIR make the case that disposal on prime farmland is a necessity. Instead, the EIR proceeds on the premise that biosolids will be applied on the state's most productive lands and attempts to analyze the potential impacts from such applications. The purpose of the EIR is "to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project." (Public Resources Code section 21061). For the following reasons, the EIR has thus far failed to fulfill its fundamental purposes. 21-3 (cont)

I. **The SWRCB's Directive:**

At the outset it is important to note that in the SWRCB's Decision 96-08, whereby the SWRCB mandated that the Central Valley Regional Water Quality Control Board could not approve its general waste discharge requirements for the land application of biosolids without first preparing an EIR (which decision ultimately led to the preparation of the current EIR), the SWRCB stated:

> "The RWQCB should also give special consideration to the unique nature of the lands in the Sacramento-San Joaquin Delta, areas within floodplains, and areas with very high ground water in its CEQA document." 21-4

While the present EIR has excluded the statutory legal Delta (as defined in Water Code Section 12220) from coverage under the General Order (GO), the GO allows the application of biosolids to lands immediately adjacent to and surrounding the legal Delta, as well as on lands within the watershed of the legal Delta. Application of biosolids on such lands will, in addition to other impacts, potentially impact ground and/or surface waters which naturally flow into or eventually are discharged into the legal Delta. As will be discussed more fully below, despite the SWRCB's directive, the EIR has failed to give adequate, much less "special," consideration to the unique nature of the lands in the Delta, to areas within floodplains and to areas with very high ground water.

II. **The EIR Has Failed to Thoroughly Document, Acknowledge and Take Into Consideration the Shortcomings of Our Current Understanding of the Full Risks Associated with the Land Application of Biosolids.**

The EIR has failed to thoroughly document, acknowledge and take into consideration the shortcomings of our current understanding of the full short-term and long-term risks associated with the land application of biosolids. The considerable uncertainty associated with the environmental and public health impacts associated with the thousands of contaminants and pathogens present in biosolids must be properly factored into the decision 21-5

making when designating areas that are suitable for land application and when specifying the conditions under which biosolids may be applied to those areas. While the EIR identifies some of the shortcomings in our current understanding of the risks associated with the land application of biosolids, the EIR fails to provide additional "safety buffers" or "uncertainty buffers" to protect the environment and the public from the extensive gaps in our scientific knowledge in this area.

As an example of the unavoidable uncertainty associated with the impacts from pathogens in biosolids, the authors of the study, "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge," explain the following:

> "It should be recognized that the list of pathogens is not constant. As advances in analytical techniques and changes in society have occurred, new pathogens are recognized and the significance of well-known ones changes. Microorganisms are subject to mutation and evolution, allowing for adaptation to changes in their environment. In addition, many pathogens are viable but nonculturable by current techniques [cite], and actual concentrations in sludge are probably underestimated. Thus, no assessment of the risks associated with the land application of sewage sludge can ever be considered to be complete when dealing with microorganisms. As new agents are discovered and a greater understanding of their ecology is developed, we must be willing to reevaluate previous assumptions." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 58).

21-5 (cont)

A. **The EPA's 503 Regulations Do Not Adequately Protect the Public and the Environment from Potentially Significant Adverse Impacts.**

At the outset, it is important to further note that while the EPA has promulgated regulations dealing with the land application of biosolids on a national scale, a review of the scientific literature and the 503 regulations themselves demonstrates that the 503 regulations fail in numerous respects to adequately protect the public and the environment from potentially significant adverse impacts. The numerous gaps and shortcomings of the EPA's minimum, national standards must therefore be filled and accounted for by the respective lead agencies for proposed biosolid applications. The numerous gaps and shortcomings of the EPA's 503 regulations leave the clear potential for significant adverse impacts on the environment.

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1. **Scientific Evaluation and Criticism of the 503 Regs.**

An example of a recent scientific evaluation and criticism of the 503 regulations is the Cornell Waste Management Institute's report entitled, "The Case for Caution. Recommendations for the Land Application of Sewage Sludges and An Appraisal of the US EPA's Part 503 Sludge Rules." (See Attachment "B" to prior comments on NOP dated 12/1/98). In the summary of that report, the authors state:

> "Current US federal regulations governing the land application of sewage sludges do not appear adequately protective of human health, agricultural productivity or ecological health. The risk assessment conducted by United States Environmental Protection Agency (USEPA) contains many gaps and non-conservative assumptions in establishing contaminant levels which are far less protective than those of many other nations. . . . The potential for widespread use of sludge on agricultural and residential land, the persistence of many of the pollutants which may remain in soils for a very long time, and the difficulty of remediation call for a more cautious approach. In addition, reassessment of standards based on ecotoxicological impacts will need to be undertaken shortly when the US EPA-sponsored study being performed by Oak Ridge National Laboratory is completed." (Id. pg. 1).

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21-7 (cont)

The report continues:

> "Additional testing of sludges is recommended. Caution is advised in application to pasture and forage . . . . Further investigation is needed to assess risks to ground and surface water and to establish standards for additional contaminants." (Id.).

Additional statements regarding the inadequacies of the 503 regs are set forth in Attachment "C" to prior comments on NOP dated 12/1/98, a letter from the Citizens' Environmental Coalition, dated April 1996, entitled, "Sewage Sludge in Agriculture: Cause for Concern."

2. **The EPA's Acknowledgment of the Inadequacies of its 503 Regs.**

The EPA itself acknowledges the limits and shortcomings of its 503 regulations. The EPA explains:

> "The Agency recognizes that today's rule may not regulate all pollutants in sewage sludge that may be present in concentrations that may adversely affect public health and the environment." (Federal Register, Vol. 58, No. 32, pg. 9253).

> "Today's rule establishes standards for those pollutants and sludge use or disposal methods for which the Agency had sufficient information to establish protective numerical limits, management practices, and other requirements." (Id.).

21-8

> "The scope of the part 503 standards is necessarily constrained by the adequacy of information on sewage sludge pollutants and means of use or disposal. However, rather than wait for more complete information in order to promulgate all-inclusive regulations, the Agency is promulgating standards for those pollutants and use or disposal practices for which sufficient information exists." (Id., pg. 9252).

> "EPA deferred consideration of pollutants for which EPA lacked human health criteria or sufficient data. . . . [For example,] [w]hen EPA initiated [their] pollutant assessments in 1984, the Agency did not include dioxin as a pollutant evaluated for this rule. At that time, EPA lacked the data required to assess numerical limitations for dioxin in sewage sludge. In addition, adequate data were not available on the levels of dioxin or its pervasiveness in sewage sludge." (Id. pg. 9264).

Thus, with regard to dioxin, the EPA further explains:

"Dioxins, which may be present in sewage sludge, are not regulated not because they are believed safe but because at the time EPA initially screened pollutants for regulation it lacked data to evaluate dioxins for regulation." (Id. pg. 9384).

21-8 (cont)

Some of the other pollutants which were similarly deferred not because they posed little risk to the public and the environment, but, sadly, because the EPA lacked sufficient data to determine the extent of the risk they posed are listed in Table III-3 on page 9265 of the Federal Register Vol. 58, No. 32. (Note that this list is not exhaustive, see Id. pg. 9384).

III. Ground and Surface Water Impacts.

Given the considerable effort and expense our public wastewater treatment facilities undergo to concentrate and extract the potentially harmful contaminants and pathogens from the wastewater such that the wastewater effluent can be safely returned to the waterways, it should be obvious that adequate steps should be taken to ensure that these contaminants and pathogens which can not be directly applied to our waterways are not indirectly applied to our waterways as a result of biosolid applications to areas which create an unreasonable and unnecessary risk of contamination of our state's surface and ground waters.

With regard to potential ground and surface water contamination, the CDWA believes the available scientific evidence demonstrates that the staging, storage and bulk application of biosolids should be prohibited in the following areas:

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(1) Any area onto land having less than 60 feet of depth to groundwater.
(2) Any area for which the elevation is not at least three feet above the 100 year flood plain elevation.
(3) Any area protected from flooding by levees.
(4) Any area within the inundation zone of any dam or dam failure.
(5) Any area within 850 feet from any water well.
(6) Any area within 850 feet from surface waters, including creeks, ponds and marshes, water supply ditches and canals, and drainage ditches and canals which discharge into surface waters.

As will be discussed more fully below, the CDWA believes there is substantial evidence to support a fair argument that the land application of biosolids in any of these areas may result in potentially substantial adverse impacts on the environment.

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A. Groundwater Impacts:

1. The Available Scientific Evidence Justifies the Imposition of an Adequate Vertical Buffer.

The GO fails to adequately protect the groundwater from potentially significant contamination. While the EIR acknowledges that shallow groundwater is one of the major risk factors with regard to the leaching of contaminants to groundwater (e.g., EIR pg. 3-36), the EIR fails to designate a minimum vertical buffer from the land application site to the underlying groundwater which will minimize or reduce the GO's adverse impacts on groundwater. The CDWA believes the available scientific evidence demonstrates that the land application of biosolids to areas with less than 60 feet to groundwater unnecessarily and unreasonably subjects the groundwater to potentially significant contamination. The risk of groundwater contamination is unnecessary since there is ample land throughout the state with greater that 60 feet to groundwater upon which biosolids could be applied. Moreover, as will be discussed more fully below, the risk is unreasonable since the available scientific evidence demonstrates that viruses have traveled at least 60 feet to groundwater and that other pathogens and pollutants may potentially travel such distances via "preferential flow" routes.

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The need for an adequate vertical buffer is readily apparent from a review of the available scientific evidence. While the CDWA presented evidence of the "preferential flow" phenomenon in its comments on the Notice of Preparation (dated December 1, 1998), the EIR has apparently overlooked and failed to consider this information. This evidence is obviously relevant and as such must be adequately discussed and taken into consideration in the EIR.

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With regard to the leaching of metals, the Cornell Waste Management Institute (CWMI), explains:

"The generally-held belief that metals in sludges cannot readily leach has been called into question by recent data. Working with undisturbed soil columns rather than the repacked soil columns used in previous experiments, the potential for leaching of metals has been demonstrated. In undisturbed soils, channels created by worms and roots and other processes ('macropores') provide for rapid downward water movement that can limit the adsorption or chemical interactions between the percolate and the soil (Camobreco, et al., 1996). Transport appears to be governed by this fast and far-reaching preferential flow and by the relatively non-reactive forms of some of the metals, i.e., as soluble and/or colloidal complexes which is enhanced by the organic matter in sludges (Richards, et al., 1998). Most sludge research to date has overlooked this phenomenon." (Case for Caution 1999 Revision, pg. 23). (Emphasis added).

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The CWMI goes on to add:

"High pH (such as in alkaline-stabilized sludge products) can actually increase leaching since the solubility of some organically-complexed metals is high under such conditions. Examination of field research data collected over the years by many researchers shows that typically up to half of some metals applied in sludges appear to be 'missing' from the soil and may have leached (Baveye, et al., 1999). Transport of a range of metals in percolating water has been directly observed at a field site where sludge was applied more than a decade earlier (Richards, et al., 1998). Concentrations of Cd, Ni, and Zn exceeded drinking water standards in leachate collected from lysimeters immediately below soils receiving sludge 20 years after a large quantity of sludge had been applied to agricultural soils (Richards, et al., 1998). Calculations of impacts on groundwater indicate the potential for violation of drinking water standards in the vicinity of sludge application sites." (Id.).

Other statements regarding leaching include the following:

With regard to the leaching of metals to groundwater, please see Attachment "H" to prior comments on NOP dated 12/1/98 for the recent study entitled "Movement of Heavy Metals Through Undisturbed and Homogenized Soil Columns" which indicates:

"[P]revious laboratory metal leaching studies performed on homogenous soils might have greatly underestimated metal mobility in the field and that preferential flow [e.g., flow through cracks, worms holes and macropores, etc.], both alone and in combination with organic-facilitated transport can accelerate metal leaching through soils." (Id. at pg. 740).

Moreover, as the recent study entitled, "Mobility and Solubility of Toxic Metals and Nutrients in Soil Fifteen Years After Sludge Application," explains:

"[T]he supposition that metals have not migrated substantially downward in soils is usually based on the lack of a marked increase of total or readily extractable metals in the subsoil immediately below the sludge/soil layer. It should be recognized that bypass flow through structural cracks, root channels, wormholes, and other highly conductive paths and the presence of fairly nonadsorptive soluble complexed forms of metal can create conditions conducive to significant metal leaching without markedly increasing the *average* metal concentration in the subsoil (Sidle and Kardos 1977; Camobreco et al. 1996). (Emphasis added). (See Attachment "I" to prior comments on NOP dated 12/1/98, pg. 488).

Moreover the study additionally explains:

"Researchers have further noted that lab-determined distribution coefficients, Kd, for metal adsorption in sludge-amended soils tend to grossly overestimate

21-13 (cont)

metal retention in the field situation (Persicani 1995; Sidle et al. 1977)." (Emphasis added). (Id. pg. 489).

21-13 (cont)

To the extent the EIR concludes that the available scientific evidence does not support the need for a minimum vertical buffer to groundwater, the EIR should indicate whether the scientific studies it relies on to make that determination have overlooked the preferential flow phenomenon. In the end the SWRCB will have to support its findings with regard to the environmental impacts from the GO with substantial evidence. As the CEQA Guidelines explain, "[E]vidence which is clearly erroneous or inaccurate . . . does not constitute substantial evidence." (Guidelines section 15384). As is self-evident, sludge experiments which overlook the preferential flow phenomenon are inaccurate and erroneous and, as a result, underestimate the potential leaching of pathogens and pollutants to the groundwater.

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From the abovementioned evidence summarized by the Cornell WMI, it is clear that the available scientific evidence demonstrates that an adequate vertical buffer is needed to protect against the migration of pollutants and pathogens. While there is no guarantee that 60 foot buffer recommended by the CDWA will prevent significant contamination of groundwater given the potential "preferential flow paths" which pathogens and other contaminants can travel, 60 feet would appear reasonable based on existing information. This minimum depth could be increased or decreased in the future as scientists gain a better understanding of preferential flow and other factors which affect the vertical migration of pathogens and contaminants. As the Cornell WMI further explains:

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"Further investigation is needed to ascertain if there is a significant concern for both metals and pathogens in groundwater, as viral pathogens could migrate by preferential flow as well." pg 23. There is need for field data regarding the movement of pathogens, particularly where groundwater is found at shallow depths and soils are conducive to preferential flow. Few viruses have been studied in regard to sludges and unfortunately unlike viruses behave differently (Dubovi, 1997). No monitoring is currently required for viruses in sludges or sludge products." (Case for Caution, pgs. 28-29).

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Additionally and importantly, the authors of ["Movement of Heavy Metals Through Undisturbed and Homogenized Soil Columns", supra] further indicate:

"The literature shows that metals movement through soil is still not well understood. The roles of preferential flow paths and soluble organic matter are especially unclear." (Id. at pg. 742).

Rather than subject the state's groundwater to potentially significant contamination, the GO should provide at least a 60 foot vertical buffer to minimize such contamination since (1) the available scientific evidence demonstrates that viruses have traveled at least 60 feet to groundwater, (2) migration of contaminants and pathogens via preferential flow has been widely overlooked, (3) preferential flow can provide for "rapid downward movement" that

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can lead to significant leaching of contaminants and pathogens, and (4) since there has been no demonstration that there is a scarcity of available land for land application which has at least a 60 foot buffer to groundwater. (The CDWA hereby renews its request that the EIR survey the potential land available for land application of biosolids and make a finding whether there is adequate land with 60 feet or greater to groundwater to accommodate the projected increase in biosolids over the next fifteen years--i.e., the EIR's impact analysis time frame).

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As stated above, the available scientific evidence indicates that viruses have migrated downward through the soil up to 60 feet. In the study entitled, "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge," it states:

> "In contrast [to studies using viruses that are highly adsorbed in soil] Gerba and Bitton (1984) reported that coxsackie B3 virus was able to migrate 18.3 m when sewage effluent was applied to land used for artificial groundwater recharge. Downward migration from sludge-amended soils using viruses that adsorb poorly to soil like group B coxsackie has not been studied. . . . Only a limited number of virus groups have been studied to date." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 76).

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Despite the fact that this study used sewage effluent that was applied to land used for artificial groundwater recharge, a 60 foot buffer nevertheless appears to represent a reasonable buffer given our current lack of an adequate scientific understanding of the vertical migration of pathogens and contaminants. Since the preferential flow phenomenon has been widely overlooked and since only a limited number of virus groups have been studied (apparently none of the viruses which adsorb poorly to soil like group B coxsackie have yet been studied) 60 feet may not be as conservative as it may first appear. Nonetheless, the CDWA believes 60 feet would provide a reasonable level of protection until the scientific community has an opportunity to further investigate the preferential flow phenomenon with regard to both pathogens and other pollutants in biosolids. As was stated above, the minimum vertical buffer could be increased or decreased in the future in response to future scientific research.

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In the event the preparers of the EIR continue to maintain that no minimum vertical buffer is scientifically justified, the EIR (and ultimately the SWRCB) must base that finding on substantial evidence. Before dismissing (and hopefully not ignoring) the results in the abovementioned coxsackie B3 study, the EIR should thoroughly address the following questions, among others:

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- The extent coxsackie B3 can be present in Class A and Class B biosolids.

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  - Must consider all of the abovementioned shortcomings with the 503 regs, not the least of which are the inadequacies of the pathogen reduction methods, the potential for pathogen regrowth after treatment, and the accidental or negligent application of biosolids that have not met the Class A or Class B standards.

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- Extent to which other viruses with similar characteristics as coxsackie B3 (e.g., viruses that absorb poorly to soil) are present in Class A and Class B biosolids.

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- Whether viruses and other contaminants which we know very little about and/or which we are not scientifically able to detect or study can move through soil similarly or more easily than coxsackie B3.
  - "Downward migration from sludge-amended soils using viruses that adsorb poorly to soil like group B coxsackie has not been studied. . . . Only a limited number of virus groups have been studied to date." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 76).

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    - To date, have viruses like group B coxsackie been studied?
    - To date, what virus groups have been studied?
    - Did these studies take into consideration the preferential flow phenomenon?
  - "The literature shows that metals movement through soil is still not well understood. The roles of preferential flow paths and soluble organic matter are especially unclear." (See Attachment "H" to prior comments on NOP dated 12/1/98, pg. 742).
- Whether biosolids will be applied to lands which due to their soil makeup and/or the presence of preferential flow paths are similarly capable of transferring viruses (and other contaminants) 60 feet below the surface.

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- The extent to which irrigation, the intentional leaching of salts and other minerals from the soils, flooding (and the resulting pooling of water), and rainfall, or a combination of these situations can similarly drive viruses and other contaminants 60 feet or more below the surface.

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2. The Proposed GO's (and the Modified GO's) Groundwater Protection Provisions are Inadequate.

Prohibitions No. 3 of the General Order states:

"The discharge shall not cause or threaten to cause pollution, as defined in Section 13050 of the California Water Code."

In spite of the EIR's recognition that shallow groundwater is a major risk factor contributing to the leaching of contaminants to groundwater (e.g., EIR pg. 3-36), the EIR fails to propose (and the GO fails to specify) a minimum depth to groundwater. While it is difficult to comprehend given the available scientific evidence described above, the GO apparently allows biosolids to be applied on any land that is not "water-saturated." (GO, Prohibition A-15). While the term "water-saturated" is apparently not defined, it would appear that land with groundwater twelve (12) inches below the surface, for example, would not constitute water-saturated land. (Note: The GO should define water-saturated). It thus

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appears that the GO would potentially allow the land application of biosolids to lands where the groundwater is extremely close to the surface. As has been explained in detail above, the CDWA believes this is unacceptable and unreasonably and unnecessarily subjects the groundwater to potentially significant contamination.

21-28 (cont)

In lieu of designating a minimum vertical buffer to protect the groundwater, the EIR preparers apparently believe that provision #5 of the proposed "Pre-Application Report" is sufficient to protect the groundwater. As will be discussed more fully below, provision #5, entitled, "Ground Water Monitoring," is wholly inadequate to protect the groundwater from contamination from pollutants and pathogens.

The so-called ground water monitoring program would potentially (not automatically) apply to "biosolids' application operations where minimum depth to useable ground water is less than 25 feet." (Note: The GO should define "minimum depth . . . is less than 25 feet"--e.g.. does it refer to the highest water level in the last year, in the last 10 years?). This program "at a minimum, consists of three monitoring wells (one upgradient, two downgradient) for each application area is required . . . ." The deficiencies in this program are numerous. First, the monitoring program only applies when biosolids are applied "more than twice within a five-year period at any particular location." Unfortunately. the EIR lacks substantial evidence to support the finding that less than two biosolid applications in five years will not have a significant impact on groundwater. What if the depth to groundwater was less than 60 feet? Less than 25 feet? Less than 1 foot? Presumably it does not matter. The EIR simply lacks accurate scientific and factual information to support this exemption.

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Second, the monitoring program may be entirely waived by the Executive Officer "if it is determined that the benefit of such monitoring is not commensurate to the level of protection." The EIR fails to indicate what scientific evidence the Executive Officer will rely on to make such a determination. Unfortunately, the EIR has avoided a thorough evaluation of what depth to groundwater is necessary to adequately protect the groundwater. As such, the EIR does not provide the requisite analysis from which the Executive Officer could determine (1) what level of protection the groundwater monitoring will provide, or (2) the extent of the benefit afforded by that protection. Moreover, it is improper for the EIR to defer the analysis of the projects potential impacts on groundwater to the Executive Officer. The EIR's fundamental role is to investigate and analyze the potential impacts of the proposed GO. Allowing the Executive Officer to independently asses the level of protection afforded to a particular site by the monitoring program would violate CEQA. If the EIR fails to address the potential impacts of the GO on groundwater across the entire range of potential site conditions throughout the state, then the EIR should be converted into a "program" or "master" EIR which would then be followed up with supplemental CEQA documents for each particular site.

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Third. the EIR claims that "In areas with shallow groundwater, monitoring is required that would result in early detection if leaching of substantial quantities of pollutants were occurring."3-35. As was described above, monitoring is not required if biosolids are applied

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2 or less times in five years and if the Executive Officer decides it is not necessary. Thus in either of these situations, early detection will not occur. Moreover, even when monitoring is required, it does not require testing of metals, organic compounds, or pathogens. Thus early detection of leaching of metals, organic compounds, and pathogens will not occur.

21-32 (cont)

Finally, while the CDWA believes biosolids should not be applied to lands with less than 60 feet to groundwater, to the extent the EIR relies on groundwater monitoring in addition to or in lieu of providing an adequate vertical buffer, the monitoring must test for metals, organic compounds and pathogens. Moreover, to the extent the EIR relies on groundwater monitoring in lieu of setting a minimum depth to groundwater, the EIR must present factual, scientific evidence supporting its conclusion that its groundwater monitoring program will "result in early detection if leaching of substantial quantities of pollutants were occurring." For example, the EIR should discuss, among other issues: (1) under what circumstances the minimum 3 wells will be sufficient, i.e., for what size site is 3 wells adequate, a 5 acre site? A 2,000 acre site?; (2) whether one sample once a year is sufficient; (3) whether other wells in the vicinity of the site will create a depression which will affect the flow of contaminants away from the designated monitoring wells; (4) whether the typical tests for pathogens--e.g., the fecal coliform test--will sufficiently detect the presence of the entire range of pathogens that may have leached from the application site (E.g., the EIR should take into consideration the fact that "negative coliform tests do not provide assurance that water is free of Giardia cysts . . ." EIR, pg. E-14), (5) the extent to which subsurface farm drains (if present), such as "tile drains" will drawn the leached pathogens and contaminants away from the monitoring wells and into surface waters, etc.

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In general, the EIR should consult scientists who specialize in groundwater monitoring and obtain their professional advice on what form of testing protocol is necessary to "early detect" leaching of all of the various contaminants and pathogens present in the biosolids. For example, precisely what constituents should be tested. how often should they be tested, how deep in the saturated zone should the samples be taken, how many samples should be taken during each sampling event, how many wells should be monitored, where should the wells be placed--i.e., in the middle of the application site, along the perimeter of the site etc.--how many years after the last application of biosolids should the wells continue to be tested, etc.? The scientists should then provide their professional opinion as to how much protection such monitoring will provide.

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B. **Horizontal Migration:**

With regard to the horizontal migration of pathogens, the scientific evidence demonstrates that "once [pathogens are] in groundwater, they may travel significant distances from the site." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 84). The CDWA believes the available scientific evidence demonstrates that the land application of biosolids should be prohibited to any area within 850 feet from any water well; surface waters, including creeks, ponds and marshes, water supply ditches and canals; and drainage ditches and canals which discharge into surface waters. For example, viruses have been detected in groundwater 820 feet from the application site:

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" . . . Koerner et al. (1979) detected viruses in samples collected at a depth of 55 feet and 820 feet away from a rapid infiltration site in New Jersey." (See Attachment "J" to prior comments on NOP dated 12/1/98, pg. A-2).

With regard to the potential for horizontal movement of viruses to distances of 820 feet as reported by Koerner, et al., similar concerns and questions as stated above with respect to the studies regarding the 60 foot vertical movement must be addressed in order to accurately assess the significance of the study.

21-35 (cont)

The EIR unfortunately lacks scientific information regarding the factors which contribute to the horizontal and vertical movement of pathogens and contaminants once they reach the saturated zone (i.e., the groundwater aquifer). The EIR should solicit scientific information regarding these various factors and investigate and discuss the following issues, among others: How far and how quickly will the various contaminants and pathogens travel vertically and horizontally in the saturated zone? What factors influence their movement? Will they concentrate near the top of the water table (will some of the pollutants and pathogens float? If so which ones?) Or, rather, will they continually drive downward as a result of gravitational forces?

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It is clear that all of these factors are essential in order to adequately designate setback distances from nearby wells and surface water sources (where the groundwater could accrete to the surface waters, etc.). As mentioned below in the comments under the heading "Discharge Specification #8," the EIR must thoroughly present the factual, scientific basis for each of the proposed setback distances. While there is no guarantee that the 850 foot horizontal buffer recommended by the CDWA will prevent significant contamination of groundwater, 850 feet would appear reasonable based on existing information. This minimum buffer could be increased or decreased in the future as scientists gain a better understanding of the factors which influence the horizontal migration of pathogens and contaminants in the groundwater.

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The EIR should also bear in mind the extremely low infection dose for many pathogens:

> "Significant numbers of pathogens exist in sludge even after stabilization and treatment. If these pathogens can remain viable for extended periods of time, groundwater sources beneath sludge disposal and land application sites may become contaminated. Pathogens may not be significantly inactivated or removed by transport through the vadose zone. Once in groundwater, they may travel significant distances from the site. For viruses and parasites, the infectious dose is low, 1-50 organisms (Gerba 1986). If the concentration of either of these pathogens exceeds 10^{-3}/mL of groundwater, there could be a significant risk of infection on an annual and lifetime basis (Gerba and Rose 1990)." (See Attachment "A" to prior comments on NOP dated 12/1/98 Hazards, pg. 85).

C. Impacts from Flooding:

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The EIR has failed to adequately investigate, analyze and discuss the potential impacts on surface and ground water quality from the application of biosolids to areas subject to flooding. The CDWA believes the land application of biosolids in an area subject to flooding may result in potentially substantial adverse impacts on the environment. To mitigate these potential impacts, the CDWA believes the available scientific evidence demonstrates that the land application of biosolids should not be applied to (1) any area for which the elevation is not at least three feet above the 100 year flood plain elevation, (2) any area protected from flooding by levees, and (3) any area within the inundation zone of any dam or dam failure.

1. The EPA Failed to Analyze the Potential Impacts From the Flooding of Land Application Sites.

The US EPA's 503 regs not only suffer from the extremely limited number of pollutants which were evaluated and regulated--merely nine out of the thousands of potential pollutants commonly found in biosolids--but, in addition. the 503 regs wholly lack any meaningful analysis of the impacts from any pollutants or pathogens from the flooding of land application sites. The EIR should therefore conduct this much needed analysis in order to adequately assess the potential impacts from the flooding of biosolid application sites.

21-39

> In the EPA's discussion accompanying the 503 regs, the EPA explains: "The proposed general requirement that was deleted from the final regulation concerns restricting the flow of a base flood, reducing the temporary storage capacity of a floodplain, or posing a hazard to human health, wildlife, or land or water resources because of sewage sludge in the runoff from the base flood." (Federal Register, Vol. 58, No. 32, pg. 9330). (Emphasis added).

With regard to the potential impacts from the run-off of pollutants from flooded land, the EPA states the following reasons for dismissing (and ignoring) the concerns from floodwater runoff:

(1) "[T]he probability that sewage sludge will be land applied to a 100 year floodplain is low . . . .", and

(2) "[P]ollutant limits in the land application subpart are designed to protect run-off of pollutants into surface waters (i.e., the surface water pathway was evaluated during the land application exposure assessment)" (Id. pg. 9330).

There are numerous gaps and shortcomings associated with the EPA's "assessment" of the potential impacts from flooding, not the least of which is the EPA's unwarranted and inaccurate assumption that "the probability that sewage sludge will be land applied to a 100 year floodplain is low." This assumption, however, nevertheless helps explain the 503 regs's clear deficiency of any meaningful analysis of the impacts from the flooding of biosolid application sites.

A review of the 503 regulations demonstrates that the EPA has failed to give any attention to the peculiar impacts typically associated with flooding. For example, the EPA has failed to consider the following impacts, to name a few:

(1) The nature and extent biosolid pollutants and pathogens will enter the waterways as a result of erosion of the soil typically associated with flooding. (See Attachment "D" to prior comments on NOP dated 12/1/98).

(2) The extent to which biosolid pollutants and pathogens will be absorbed or re-suspended in the floodwaters as the floodwaters pass over the sites or collect or "back-up" onto the sites before they eventually drain into the nearby surface waters or other low lying areas;

(3) The effect pooled or "backed-up" floodwaters will have on the downward migration of pollutants and pathogens into the underlying groundwaters; and

(4) The impacts of floodwaters on the temporary or permanent stockpiles of sludge awaiting land application.

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Moreover, the mentioned "surface water pathway" evaluation not only failed to consider any of the abovementioned concerns, but, additionally, suffers from numerous other limitations, including the following:

(1) This pathway evaluation, as well as the other EPA pathway evaluations, only looked at nine of the potentially thousands of toxic pollutants commonly found in biosolids;

(2) This pathway, as well as the other EPA pathway evaluations, entirely failed to analyze the potential impacts from the spread of pathogens[1]; and

(3) As the Cornell University Waste Management Institute explains, "The US EPA risk assessment [regarding surface water quality impacts] used unrealistic assumptions regarding dilution of contaminants [e.g., the EPA assumed only 0.24% of the model watershed receives sludge, thus failing to properly assess the impacts on smaller bodies of water]." (See Attachment "B" to prior comments on NOP dated 12/1/98 pg. 27-28).

21-41

Moreover, with regard to the significance of the amount of biosolid contaminants which may enter the surface waters the EIR should consider the following:

In the City of Modesto's Draft EIR For the Land Application of Class A Exceptional Quality Biosolids, the City of Modesto states the following based on a personal communication with Kenneth Landau, a supervisor of the Central Valley Regional Water Quality Control Board ("Regional Board"):

21-42

"If significant quantities of biosolids are discharged into a surface water body, the quality of the surface water could be degraded by:

[1] decreases in dissolved oxygen caused by oxygen demanding substances in the wastes;

[2] increased levels of bacteria and other pathogens;

[3] increases in nutrients (e.g., NO3),

[4] turbidity and color impacts, and

[5] sedimentation on the bed of the water body."

(See Attachment "E" to prior comments on NOP dated 12/1/98, pg. VI-96).

21-42 (cont)

The Regional Board's Basin Plan further explains:

"Toxicity can be associated with many discharge activities [including the land application of biosolids]. Its effects may be first expressed as acute or chronic reductions in the number of organisms in receiving waters. Minute amounts of toxic materials may also impair beneficial uses from accumulation in tissues or sediments." (Regional Board's 1994 Water Quality Control Plan, pg. IV-2.00). (Emphasis added). (See Attachment "F" to prior comments on NOP dated 12/1/98).

21-43

Thus, for the foregoing reasons, the EIR should thoroughly investigate, document, discuss and analyze the extent to which flooding may transport contaminants and pathogens into ground and surface waters, and the resulting environmental and public health impacts associated with the transport of these contaminants and pathogens. Thus far, the EIR has entirely failed to conduct this analysis.

21-44

D. Surface Water Impacts:

The EIR has failed to adequately address the potential impacts from the land application of biosolids on surface waters from storm water runoff, and irrigation return flows (both surface and subsurface) to surface waters.

Similar to the discussion and analysis stated above with regard to surface and groundwater impacts resulting from the flooding of land application sites, the EIR should thoroughly investigate, document, discuss and analyze the following:

(1) The nature and extent each of the particular biosolid pollutants and pathogens will enter surface waters as a result of storm water runoff, and irrigation drainage return flows to the surface waters.

(a) This discussion and analysis would necessarily include an examination of the extent to which each of the particular biosolid pollutants and pathogens will be absorbed or re-suspended in storm or irrigation waters as the waters pass over the sites (including the temporary stockpiles of biosolids) or drain from the sites into the nearby surface

21-45

[1] "The [EPA] Administrator concluded that it is not feasible, based on current information and the state of analytical capability, to develop numerical limitations for pathogens, vector attraction reduction, and Total Hydrocarbons at this time using the type of exposure assessment employed to develop numerical limitation for other pollutants. (Fed. Regis. Vol. 58, No. 32, pg. 9322). (See also, Id. at pg. 9324, "The pathogen requirements in the part 503 regs are not based on the results of an exposure assessment. Instead, the requirements are performance standards based on the demonstrated ability of treatment processes to reduce pathogens in the sewage sludge.").

waters.

(b) This discussion and analysis would likewise necessarily include an examination of the extent to which the storm or irrigation water leaches each of the particular biosolid pollutants and pathogens (from biosolid application areas and the temporary stockpiles of biosolids) into the underlying groundwater and subsequently transports these contaminants into the nearby surface waters via subsurface accretions to the surface waterways.

(2) Once the magnitude of the potential loading of each of the particular biosolid pollutants and pathogens to the surface waters is adequately determined, the EIR should thoroughly investigate, document, discuss and analyze the potential adverse impacts this loading will have on the full range of organisms which live in, feed from, drink from, and/or recreate in the affected surface waters.

21-45 (cont)

For this discussion as well as all others, the EIR should fully set forth the methodology it employs to determine the extent of contaminant loading to the surface waters and the impact of this loading.

Please see the comments below under the heading "Discharge Specification #8" for a discussion of what the EIR should disclose regarding the adequacy of the proposed setback distances from surface waters. The buffer distance from agricultural drains which ultimately discharge into surface waters is especially critical since these drains will very likely pick up contaminants and pathogens which are leached through the soil and/or which are picked up by the excess irrigation water, i.e., the tail water.

21-46

An example of one of the surface water contamination issues is the extent to which floodwaters, storm runoff and irrigation runoff from the proposed sites will impact the trihalomethane formation potential of our waterways. As the California Water Plan 1994 Update explains:

> "In its journey to the sea, water dissolves organic compounds present in the soil as a result of plant decay. This organic material includes humic and fulvic acids, and other organic compounds. High levels of these compounds can be present in drainage from wooded or heavily vegetated areas and from soils high in organic content, such as the peat soils which are present in parts of the Delta and other places in CA [and such as the soils on biosolid application sites]. . . . Trihalomethanes are a class of synthetic organic chemicals produced in drinking water when chlorine, used as a disinfectant, comes into contact with naturally occurring organic material dissolved in the water." (CA Water Plan 1994 Update, Bulletin 160-93, Vol. 1, pg. 111-112). (See Attachment "G" to prior comments on NOP dated 12/1/98).

21-47

In the recent Delta Wetlands' hearings before the State Water Resources Control Board (SWRCB) there was considerable testimony regarding the effects and impacts of organics present in runoff from land which enters the Delta. Moreover, the Delta is a partial

21-48

or total source of drinking water for approximately two-thirds of the state (Water Education Foundation, 1994). Since the land application of biosolids is being touted for its ability to provide a large supply of organics to the land, the proposed project has the potential to substantially exacerbate the amount of trihalomethanes in our drinking supplies. The EIR should adequately investigate, document, discuss and analyze the potential impacts from floodwaters, storm runoff, and irrigation return flows draining from the proposed applications sites on the trihalomethane formation potential of the receiving surface or ground waters.

21-48 (cont)

Another example of one of the surface water contamination issues which the EIR should thoroughly investigated is the extent to which floodwaters, storm runoff and irrigation runoff from potential biosolid application sites throughout the watershed of the San Francisco Bay will cumulatively contribute to the mercury, copper, dioxin, and other contaminant problems in the Bay. As the recent article, entitled, "Fever Breaks on Mercury," explains:

> "[The] EPA has suddenly cracked down on discharges to water bodies officially listed as 'impaired' under the Clean Water Act due to the presence of mercury, copper, dioxin and other contaminants. Both the North and South Bays are officially 'impaired.'" (See Attachment "AA" to these comments).

21-49

The EIR should analyze the cumulative impacts from the potential widespread disposal of biosolids authorized under the GO containing these and other contaminants on the already "impaired" North and South Bays. Our wastewater treatment plants have spent considerable resources extracting and concentrating these contaminants from the wastewater; does it make sense to then turn around and scatter these contaminants throughout the watershed of the Bay-Delta, especially in light of the already "impaired" waterways?

IV. Environmental Impacts from Pathogens.

The EIR has failed to adequately investigate, document, discuss and analyze the potential for the numerous pathogens present in both Class A and Class B biosolids to enter the ground and surface waters, the air, or the land in the vicinity of the application sites.

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It should be noted that, as explained above, the EPA did not conduct an exposure assessment with regard to pathogens. As the EPA explained:

> "The [EPA] Administrator concluded that it is not feasible, based on current information and the state of analytical capability, to develop numerical limitations for pathogens, vector attraction reduction, and Total Hydrocarbons at this time using the type of exposure assessment employed to develop numerical limitation for other pollutants. (Fed. Regis. Vol. 58, No. 32, pg. 9322). (See also, Id. at pg. 9324, "The pathogen requirements in the part 503 regs are not based on the results of an exposure assessment. Instead, the requirements are performance standards based on

21-51

the demonstrated ability of treatment processes to reduce pathogens in the sewage sludge.").

Thus, the potential impacts on the public and the environment from the disposal of pathogens via the land application of biosolids have simply not been analyzed or considered by the EPA, and therefore should be adequately evaluated in the EIR.

21-51 (cont)

To make matters worse, the evidence demonstrates that the pathogens present in biosolids have the potential to regrow after the biosolids leave the treatment plant. "The EPA concluded that significant regrowth of Salmonella sp. bacteria was possible if the sludge was not injected into the soil within 8-hours after it leaves the treatment works (FR 58-p. 9353)." (See Attachment "K" to prior comments on NOP dated 12/1/98, pg. 2). The EIR should thoroughly investigate, document, discuss and analyze the extent to which pathogens will regrow after the biosolids leave the treatment plants and/or after the biosolids are tested for compliance with the Class A and B standards. The EIR should then thoroughly investigate, document, discuss and analyze the potential environmental impacts from such regrowth.

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Other scientific evidence regarding the potential regrowth of pathogens, which the EIR should adequately investigate and take into consideration, include the following:

> "A major reason for enteric bacterial die-off outside of the host intestinal tract is probably their inability to lower their metabolic requirements to a lower nutrient availability (Klein and Casida 1967). Mallman and Litsky (1951) felt that the organic content of sludge enhanced bacterial survival. The survival of fecal coliforms is greatly extended in organic soils over that observed in mineral soils (Tate 1978), and the regrowth of S. typhimurium and E. coli has been observed in buried feces (Temple et al. 1980)." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 77). (Emphasis added).

21-53

> "Salmonella can multiply vigorously in sterilized sludge or slurry, but under natural conditions growth is limited or strongly inhibited by the activity of microflora (Findlay 1973)." (Id.).

> "Bacteria, unlike either viruses or parasites, can actually increase in numbers during treatment under certain conditions. Regrowth in composts that were not fully stabilized has been documented (Soares, et al., 1995). Thus a compost could have met processing requirements and standards for E. coli or Salmonella (US EPA requires testing for one or the other for Class A), but could subsequently have significant bacterial levels if regrowth occurs after testing." (Case for Caution 1999 Revision, p. 29).

The EIR should also bear in mind and take into consideration our current inability to effectively detect pathogens:

21-54

> "Currently, methods to determine the risk of disease from pathogens in land-disposed sludge are inadequate because the sensitivity of pathogen detection is poor. The application of recombinant DNA technology (gene probes and polymerase chain reaction) to environmental samples may provide increased sensitivity for detecting specific pathogens in land-disposed sludge and greatly improved risk assessment models for our exposure to these sources of pathogens." (See Attachment "A" to prior comments on NOP dated 12/1/98, pg. 85).

21-54 (cont)

With regard to cattle grazing on biosolid amended land, it should be noted that the available scientific evidence demonstrates that the risks from cattle grazing on biosolid sites to the health of the cattle and to the health of humans who consume the cattle may be unacceptably and unreasonably high. Please see Attachment "L" to prior comments on NOP dated 12/1/98, entitled, "Parasitic Hazard with Sewage Sludge Applied to Land." That report made the following findings:

> "A modification of the FAUST technique allowed a highly regular recovery of Taenia saginata eggs from sewage sludge, as well as their quantification. Despite the low viability (8%) noted, the viable T. saginata egg level remains high (20 -10^6) and offers a serious risk for cattle even after a 3-week "no-grazing" period." (Pg. 1420, title summary). (Emphasis added).

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The report further states:

> "[W]e must stress the danger of spreading 20,280,000 viable T. saginata eggs over 1 ha of grazing or pasture land, even with a 'no-grazing' interval of 3 weeks, as fixed by the recommendations of the European Economic Community dated 12 June 1986 (to be implemented in 1989). This 3-week delay is a precautionary measure than can by no means stop all hazards of parasitic disease for cattle or humans." (Id. pg. 1421).

V. Air Quality Impacts.

The CDWA believes there is substantial evidence to support a fair argument that the proposed biosolid application will have a potentially substantial adverse impact on air quality in the vicinity of the application site. In a recent study, "Occurrence of Airborne Bacteria and Pathogen Indicators during Land Application of Sewage Sludge," the study concluded,

21-56

> "It is clear . . . that physical agitation of sludge material could result in the generation of a large number of diverse bacterial populations in the immediate vicinity, raising questions of possible sludge-handling worker exposure." (See Attachment "M" to prior comments on NOP dated 12/1/98, pg. 299.)

For the purposes of this study, the "immediate vicinity" was 48 to 99 feet from the

application sites. (Id. pg. 297).

The EIR should thoroughly investigate, document, discuss and analyze the potential impacts on the public, including the local residents and workers, and the environment from airborne pathogens and toxic airborne pollutants (via wind erosion, physical sludge agitation, or otherwise). Again, the factual, scientific evidence supporting the GO's proposed setback distances must be fully explained and disclosed in the EIR. 21-56 (cont)

VI. The EIR Should Thoroughly Address the Potential Impacts from Land Application on Agricultural Land.

The CDWA believes there is substantial evidence to support a fair argument that the land application of biosolids will have a potentially substantial adverse impact on the productivity of the land upon which the biosolids will be applied. As the recent study entitled, "Mobility and Solubility of Toxic Metals and Nutrients in Soil Fifteen Years After Sludge Application," explains, biosolid applications not only have short term impacts on the productivity of the soil, but long term impacts as well. For example, on pg. 498-499 of the study, the authors explain:

> "Some trace metals, particularly Cd and Zn, remain highly plant-available in the sludge-treated soil after 15 years. Young maize plants grown in containers of soil from the S1 site accumulated in excess of 500 mg Zn kg-1 and 50 mg Cd kg-1 despite the near-neutral pH of the soil. Maize showed significant growth reduction, and tomato showed severe chlorosis and marked growth reduction accompanied by lower measured Mn concentrations in the plant tissues, symptoms attributable to antagonism from the excess Cu and Zn in the soil (McBride 1995). . . . It is clear that severe effects on plant growth and quality continue to exist more than 15 years after sludge application." (See Attachment "I" to prior comments on NOP dated 12/1/98).

21-57

The EIR should thoroughly investigate, document, discuss and analyze the potential impacts from the proposed application of biosolids on the short term and long term productivity of the land upon which biosolids will be applied.

VII. Site-Specific Environmental Analysis is Required.

The CDWA believes site-specific environmental review is necessary in order to properly minimize or avoid significant adverse impacts on the environment. The EIR should clearly set forth the background conditions--e.g., soil type, soil pH, depth to groundwater, existing levels of contaminants and pathogens in the soil, amount of rainfall, climate etc.--from which it bases its findings and conclusions that significant impacts will or will not occur. To the extent subsequent projects deviate from these conditions, their analysis will not be covered by the analysis in the EIR and thus will require future environmental review. 21-58

21-58 (cont)

VIII. Alternative Analysis.

A. **Other Reasonable Alternatives.**

The EIR should adequately discuss and analyze the following alternatives and analyze whether there would be adequate land throughout the state under these alternatives:

1. Prohibiting the application of biosolids to those areas mentioned above (under the **Ground and Surface Water Impacts** heading) which may have a potentially significant adverse impact on ground and surface water quality.
   a. Analyze whether there would be adequate land throughout the state under this alternative.
2. Prohibiting the application of biosolids to lands used to grow food or used for grazing, thereby limiting application to reclamation sites or to fiber (i.e., cotton), or cover crops.
   a. Analyze whether there would be adequate land throughout the state under this alternative.
3. Prohibiting the application of biosolids to lands used to grow fresh fruits and vegetables.
   a. Analyze whether there would be adequate land throughout the state under this alternative.
4. Segregating food processing waste from other waste.
   a. The EIR should compare and contrast the pollutant concentrations in food processing sludge with those of other sludges to determine if food processing sludge would be less harmful to the environment if land applied.

21-59

IX. Other Notable CWMI Recommendations That Should be Incorporated into the GO:

(Quotes are from the CWMI's Case for Caution 1999 revision):

A. "In addition to testing of receiving soils, monitoring for a number of currently unregulated contaminants should be required and test results provided to potential users to enable them to compare among different sludges. Tests should include synthetic organic chemicals (including dioxins and furans), antimony, beryllium, boron, chromium, and silver. If animals will be grazing or if forage is grown, copper, fluoride, iron, molybdenum and selenium should be monitored and dietary metal ratios considered." (pg. 31). 21-60

B. "Review existing data on use and disposal of radionuclides and assess potential exposures and require monitoring of sludges for radioactivity." (pg. 34). 21-61

C. "Test shallow water supply wells that are near and downgradient of field where sludges have been applied for metals and pathogens." (pg. 33). (Emphasis added). 21-62

D. "Avoid application on steep slopes, on saturated soils where runoff is excessive, or on shallow or extremely well-drained (coarse) soils where percolation to goundwater may be rapid." (pg. 33). 21-63

E. "Consider expanding pathogen testing to include both fecal coliform and salmonella and require non-detection of salmonella for Class A sludge." (pg. 34). 21-64

F. "Consider measures to apply equal controls to sludge products imported from out of state." (pg. 34).

1. To what extent will this be allowed? I think the EIR says somewhere that concentrations of CA biosolids tend to be low, or something like that. 21-65

G. "Consider stringent criteria for allowing surface application of Class B sludges based on strict necessity and an assessment of ecological and animal health impacts." (pg. 35). 21-66

X. **Specific Comments on the General Order:**

A. **Finding #s 1(b) and 1(c):**

The exemptions from the GO set forth in Findings 1(b) and 1© should not be allowed. 21-67a Thus far, the EIR has failed to provide factual, scientific evidence to justify the exemptions. The EIR must provide a thorough explanation why these biosolids will not leach 21-67b contaminants and pathogens via preferential routes and why each of the setbacks and other protections in the GO (including setbacks protecting vernal pools and pulpfish) are not scientifically justified. Moreover, the EIR should thoroughly explain what process and procedure an applicant will go through when land applying this exempted biosolids. Will 21-67c there be a process? Will there be any protections? Can the applicant literally apply it anywhere, on any crop, with no setbacks whatsoever?

Please see pathogen section above which discusses regrowth of bacteria in Class A sludges.

As the Cornell Waste Management Institute (CWMI) explains:

"Parasites such as Helminth ova are relatively resistant to inactivation when present as cysts. In Class B sludges they could be present in significant numbers and they have been documented to survive for many years in soils (Bowman, 1997)." (Case for Caution 1999 revision, p. 29). 21-68

The EIR should examine the extent parasites (that are "relatively resistant to inactivation") are present in Class A sludges, and particularly in the Class A EQ sludges which are exempted from the GO's protections.

The CWMI continues:

"Little is known about the presence and viability of Cryptosporidium and Giardia in sludges. High levels of cysts of Giardia have been detected in sludges, but they may be inactivated (non-infective). More research is needed to assess the risks posed by these protozoa (Straub, et al., 1993). (Case for Caution 1999 revision, p. 29).

The EIR should examine the extent these protozoa are present in Class A sludges, and particularly in the Class A EQ sludges which are exempted from the GO's protections. To the extent the EIR can not say for certain whether these protozoa are present in Class A EQ sludges which are exempted from the GO, then these sludges should <u>not</u> be exempted. The GO's protections should apply in order to safeguard against this gap (as well as countless others) in the current scientific understanding of the risks associated with the land application of biosolids. 21-68 (cont)

B. **Finding #10:**

The GO should require testing for <u>both</u> salmonella and fecal coliform, not just for fecal coliform. The National Research Council recommended the following:

"Until a more sensitive method for the detection of salmonella in sludge is developed, the present test should be used for support documentation, but not be substituted for the fecal coliform test in evaluating sludge as Class A." (Executive Summary, p. 3--at least on my copy from the Internet). 21-69

The CWMI similarly recommends testing for <u>both</u>:

"Consider expanding pathogen testing to include both fecal coliform and salmonella and require non-detection of salmonella for Class A sludge." (Case for Caution 1999 revision, pg. 34).

The GO should additionally require "non-detection of salmonella for Class A sludge."

C. **Finding # 11:**

If the GO will not regulate the generator, then the EIR should thoroughly explain who, if anyone, will regulate the generator. Will the EPA regulate the generator? If so, how many staff members will the EPA assign to monitor the various generators throughout the state? How often will these staff members independently verify the quality statements made by the generators? How often will these staff members conduct on-site investigations to determine whether or not the pathogen and vector attraction reduction requirements are properly being met? 21-70

As the CWMI explains:

"Enforcement (or the lack thereof) of rules and practices such as use of agricultural

best management practices is a significant issue. The concern is magnified as both federal and state budget cuts force a reduction in environmental staff. US EPA has said that they view the 503 regulations as largely 'self-implementing.'" (Case for Caution 1999 revision, p. 29).

D. **Finding #12:**

This GO should not be approved unless and until the Regional Boards can demonstrate that they have sufficient funds and staff to adequately monitor and enforce the GO. If necessary, the annual and application fees should be sufficient to cover the expected costs of the necessary regulatory oversight for that project.

E. **Finding # 19:**

This finding states that the biosolids under this order are non-hazardous decomposable wastes. How is this determination made? What testing procedure is required to demonstrate that the biosolids are "non-hazardous decomposable wastes." Precisely what pollutants are tested for? Who performs the test? Is it independently verified? How often is the test performed? Is the frequency of testing adequate to fairly represent the quality of biosolids at any given time? I.e., Do the various treatment plants experience seasonal or other fluctuations which would alter the constituents of the biosolids? If so, are these fluctuations adequately accounted for?

The EIR should thoroughly document the procedure necessary to support the determination that a particular batch of biosolids are "non-hazardous decomposable wastes."

F. **Finding # 22:**

It appears that the phrase "Mitigated Environmental Impact Report" should omit the word "Mitigated" since EIRs are not typically denominated as "Mitigated" or "Un-mitigated."

G. **Prohibition A(3):**

As discussed elsewhere in these comments, the groundwater monitoring is severely deficient and ultimately incapable of monitoring whether "the discharge will cause or threaten to cause pollution." In addition, the GO completely lacks any surface water monitoring to detect for pollution. Without adequate monitoring, the SWRCB, the regional water boards, the public and the environment will have no means to enforce this prohibition. As such, the GO should investigate and discuss the type of monitoring of nearby ground and surface waters which would allow meaningful enforcement of this prohibition.

H. **Prohibition A(4):**

The EIR should thoroughly explain how this prohibition is enforced. How will the regulators and the public know if the discharge of biosolids will result in "the application of any material that results in a violation of the Safe Drinking Water and Toxic Enforcement Act." How often, if ever, will the biosolids be tested for the multitude of contaminants designated in this act? Who will perform the test, the generator, the discharger, an

21-70 (cont)

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independent party? Please thoroughly explain the compliance and enforcement of this prohibition.

21-75 (cont)

I. **Prohibition A(7):**

The EIR should thoroughly present the factual, scientific basis (1) for determining that the retention of irrigation runoff for 30 days will adequately protect nearby surface waters from contamination (in the absence of a 33 foot vegetation buffer)--why 30 days? Cattle are not allowed to graze for 90 days? Etc.; and (2) for determining that a 33 foot vegetation buffer is adequate in the event there is no retention of irrigation runoff. Precisely what were the various assumptions used in that determination, i.e., how dense is the vegetation, how steep is the slope, are biosolids incorporated into the soil, etc.?

As the court in Santiago County Water Dist. v. County of Orange, (1981) 118 Cal.App.3d 818, 831, explained:

> "The EIR must contain facts and analysis, not just the agency's bare conclusions of a public agency. An agency's opinion concerning matters within its expertise is of obvious value but the public and decision-makers, for whom the EIR is prepared, should also have before them the basis for that opinion so as to enable them to make an independent, reasoned, judgment."

21-76

As such, the EIR must present the facts and analysis it used to arrive at the above retention period and buffer zone.

J. **Prohibition # 11:**

The EIR should thoroughly explain how this prohibition is enforced. How will the regulators and the public know if the discharge of biosolids will result in "the application of 'hazardous waste'? How often, if ever, will the biosolids be tested for the multitude of contaminants designated as hazardous wastes? Who will perform the test, the generator, the discharger, an independent party? Will the test results be available to the public? What assurance is there that each particular truckload of biosolids will not contain any hazardous wastes? Please thoroughly explain the compliance and enforcement of this prohibition.

21-77

In addition please explain the meaning and significance of the following statements on page 5-21 of the EIR:

> "Biosolids that meet the 503 requirements are not subject to hazardous waste regulations because the maximum concentration levels (ceiling levels) are below the levels that would result in the material being classified as a hazardous waste. Section 14505 of the CA Food and Agricultural Code classifies soil amendments derived from municipal sewage sludge as fertilizing material which is exempt from hazardous waste regulations."

21-78

The explanation, among other things, should specifically indicate which hazardous waste laws

or regulations, if any, biosolids are allegedly exempt from?

21-78 (cont)

K. **Prohibition # 13:**

The GO should specifically define what is meant by "water-saturated", "frozen ground", and "periods of precipitation that induces run-off from the permitted site"? For example, how close to the surface must the groundwater be in order for the land to be classified as "water-saturated," a few feet, a few inches?

21-79

L. **Prohibition # 15:**

The GO should specifically define what constitutes "areas where biosolids are subject to erosion or washout offsite." Do these areas include: (1) Any area for which the elevation is not at least three feet above the 100 year flood plain elevation, (2) Any area protected from flooding by levees, and (3) Any area within the inundation zone of any dam or dam failure.

21-80

M. **Discharge Specification # 1:**

The GO should adopt the recommendations stated in Finding #10 above.

21-81

N. **Discharge Specification #7(a):**

Prohibition #7 suggests that all biosolids, Class A and B, must meet this requirement, not just Class B. Please explain. The CDWA believes that no types of biosolids should be exempt from this requirement. Again, the EIR should address the concerns expressed in prohibition #7 above.

21-82

O. **Discharge Specification #8**

The EIR should thoroughly present the factual, scientific basis for each of these setback distances. As mentioned above:

> "The EIR must contain facts and analysis, not just the agency's bare conclusions of a public agency. An agency's opinion concerning matters within its expertise is of obvious value but the public and decision-makers, for whom the EIR is prepared, should also have before them the basis for that opinion so as to enable them to make an independent, reasoned, judgment." (Santiago, supra).

21-83

Presumably these setback distances where not "arbitrarily and capriciously" drawn out of thin air, thus the EIR should present to the public the precise basis for these distances. What were the factors that were taken into consideration for setting each of these distances and how did the GO arrive at the specific distance. To the extent these distances where based on "best professional judgment," the EIR should fully disclose precisely what that professional judgment was based upon.

The CDWA objects to the provisions allowing the Executive Officer to reduce the setback distances from domestic and non-domestic water supply wells. If a discharger can demonstrate that lesser distances may be required, then the EIR should fully discuss the

21-84

conditions which would justify a lesser distance. Again, the scientific basis for these setback distances, and the justifications for any reductions, must be fully disclosed to the public and the decision-makers. It is inappropriate for the EIR to avoid a scientific discussion of the conditions, if any, under which the setback could be reduced. Moreover, there has been no demonstration that the Executive Officer is sufficiently qualified to make the determination that "the ground water, geologic, topographic and well construction conditions at the specific site are adequate to protect the public health of individuals using the supply well" or to protect groundwater. The EIR is supposed to gather the requisite information from the scientific community and from the public in order to make that determination. The Executive Officer should not and can not be expected to make that complex determination.

21-84 (cont)

P. **Biosolids Storage and Transportation Specification #7:**

The EIR should more specifically describe how the biosolids' storage facilities will be "designed, maintained, and operated to minimize the generation of leachate and the effects of erosion." As it stands, the public and the decision-makers do not have any information upon which to assess the adequacy of the groundwater and surface water protections from these facilities. What will be the depth to groundwater? How porous will the soil be underneath the facility? Will there be an impermeable liner underneath the facility? Etc. If the EIR preparers elect to avoid analyzing the potential impacts form the storage facilities, then future CEQA review of such facilities should be expressly required in the GO. If the current EIR intends to cover the proposed storage facilities, then the EIR should thoroughly describe the features of the storage facilities and thoroughly discuss the factual, scientific information supporting the EIR's findings regarding the potential impacts from the facilities.

21-85

Q. **Provisions (Section D) in General:**

The landowner, the tenant or other operator of the property, the generator of the biosolids or septage which in the case of sewage sludge would be the owner of the publicly operated treatment works, the transporter of the biosolids and the applicator of the biosolids should be required to sign the application and pre-application reports and also agree to be responsible for any resulting contamination and pollution and any required cleanup of the land and water. The limited testing and monitoring makes the process dependent upon the integrity of those involved. Without responsibility for cleanup, the generator and transporter lack incentive to police their own operations.

21-86

R. **Provision # 18 :**

The monitoring records should be maintained longer than three years from the date of the sample. The regional boards should archive the monitoring records and preserve them as long as possible in order to assess both the short term and long term impacts of the project. At the very least the discharger should be required to keep the records for the entire life of the particular project.

21-87

S. **The Preapplication Report:**

1. The Map:

The map must show both current and abandoned wells and mine shafts, and any other potential routes to groundwater. 21-88

2. Constituent Concentrations:

The GO needs to ensure that each and every truckload of biosolids (1) meets the constituent concentrations set forth in the preapplication report, (2) does not contain "hazardous waste" as required in prohibition #11, and (3) does not violate the Safe Drinking Water and Toxic Enforcement Act as required in prohibition #4. Thus, far the EIR has not demonstrated how this will be achieved. The EIR should thoroughly describe the procedures which will ensure that each and every truckload will meet these requirements. How often will the biosolids be tested? With regard to pathogens, and the potential for regrowth, how soon before application will each load be tested? If every load is not tested immediately prior to application, then the EIR must fully explain how the public and the environment can be assured that the frequency of testing which will occur is representative of each particular load of biosolids coming from the batch that was tested. To what extent are there seasonal or other fluctuations in the constituents in biosolids which will not be reflected by the particular sample which was tested? How representative are the samples that are drawn from large piles or lagoons of sludge? How many samples will be drawn? Who will draw the samples, an independent party? How are temporary breakdowns or shutdowns in treatment plants accounted for? 21-89

Moreover, the dischargers should be required to record and report the source of each truckload of biosolids so that the final disposition of biosolids from the treatment plants can be accounted for and to facilitate remediation in the event there is concern about a particular treatment plant's biosolids. 21-90

Moreover, the GO should require at least annual testing of the soil for concentrations for metals, pathogens and other pollutants in order to monitor the quality of the soil and the buildup of pathogens and contaminants. 21-91

Additionally, the GO should require frequent testing and monitoring of the nearby surface waters for metals, pathogens and other pollutants in order monitor the potential transport of contaminants to surface waters. 21-92

XI. Potential Typos:

A. On pg. ES-7, please verify that the last sentence in the 3rd paragraph is intended to say "Category 'b' complexity rating." 21-93

B. Please check the following: Page 5-29, Mitigation Measure 5-2; page 4-12 mitigation measure 4-2; and again on page 3 and 5 of table 15-1. These statements are difficult to reconcile. Please explain the meaning and significance of the 90 day grazing period and the 60 day "using" period? 21-94

C. On page 5-34, last paragraph, it states that the GO "contains sufficient provisions to prevent such occurrences [including] minimum depth to groundwater . . . ." While the GO clearly should designate a minimum depth to groundwater, the GO fails to do so. 21-95

D. On page 3-19, the EIR apparently omits the "lack of data" as one of the EPA's major reasons for not setting regulations for organic compounds. For example, with regard to dioxin, the EPA explained:

> "Dioxins, which may be present in sewage sludge, are not regulated not because they are believed safe but because at the time EPA initially screened pollutants for regulation it lacked data to evaluate dioxins for regulation." (Federal Register, Vol. 58, No. 32, pg. 9384). 21-96

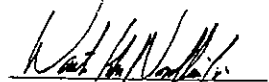
E. Page 14 of table 15-1 should say "less" than 25 feet (not "greater"), right? 21-97

XII. Conclusion.

For the foregoing reasons, the EIR has failed to fulfill its fundamental purposes. In particular, the EIR has failed (1) to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; (2) to adequately discuss ways in which the significant effects of such a project might be minimized; and (3) to adequately analyze alternatives to the proposed project. The CDWA respectfully requests the lead agency to provide a "detail[ed] good faith, reasoned analysis in response" to the above comments and to those of other commenting parties as required by CEQA Guidelines section 15088(b). 21-98

If you should have any further questions regarding our concerns please do not hesitate to contact us.

Very truly yours,



Dante John Nomellini, Jr.
Co-counsel for the
Central Delta Water Agency

DJR:djr
Enclosure

yield further evidence that the presence of toxics in the environment can screw around with the wildlife, according to a June 17 article in the *Sacramento Bee*. Monitoring conducted by CH2M Hill found that 29 of 87 mice and voles at the former Kesterson National Wildlife Refuge — once a collection point for selenium and pesticide-laced agricultural drainage from the San Joaquin Valley — had both male and female sex organs. Researchers will now try to home in on the culprit — possibly the locally high levels of selenium, possibly something else — as well as to determine if this is a Kesterson-unique phenomena. Gruesome deformities and deaths in waterfowl eggs and embryos linked to selenium led to the closure of Kesterson back in 1986. Contact: gsantalo@ch2m.com

DREDGED MATERIAL DUMPING IN THE BAY will decrease by 75% over the next 50 years under a regional dredging and disposal strategy signed by five government agencies on July 16. This record of decision is the product of ten years of collaborative effort on the part of regional government, shippers and environmentalists to break out of the mudlock of the 1980s, when concerns about the ecological impacts of the then Bay-centered-disposal program blocked efforts to expand local shipping. The new plan is to divvy up the dredge spoils in a more balanced manner, with only 20% going back into the Bay, 40% going out to an ocean disposal site, and the remainder going to wetland restoration, levee repair and landfill cover projects. Contact: (415)744-2201

WHERE DIOXINS COME FROM depends on whom you ask, according a June 24 article in the *Contra Costa Times*. U.S. EPA, for example, says only 9% of this man-made carcinogenic chemical comes from cars, trucks, buses and other mobile sources, as well as wood burning stoves, whereas the local air district puts the figure at 66% and the regional water quality board at 84%. Similar disparities appear in estimates of industry's share. Scientists say it's time to stop the finger-pointing and focus instead on which sources are the most controllable.

A BAY AREA MASTER PLAN FOR WATER RECYCLING released this July by 13 local and regional agencies suggests that cost-effective use of recycled water could reach 125,000 acre feet by the year 2010 and grow to up to 500,000 acre feet by 2040. Planners zeroed in on the least costly means of connecting potential users of recycled water with the treatment plants that produce the supply, with a goal of offsetting water shortages projected for dry years. The Master Plan also identifies 18 potential wetland sites and 13 streams where recycled water could be used to swell the quantity, and sweeten the quality, of the water. Contact: www.recyclewater.com

AN ORDINANCE REQUIRING MID-OCEAN BALLAST WATER EXCHANGE for vessels calling at the Port of Oakland was passed by the Board of Port Commissioners this June and went into effect August 1. The ordinance aims to protect the Bay from further invasions of non-native marine life via ballast water from foreign ports. Contact: (510)272-1179

YOUR INDEPENDENT SOURCE FOR BAY-DELTA NEWS & V

ESTUARY

Fever Breaks on Mercury

Shoes that light up, greeting cards that play music, orange paint and crematoria... These are just a few of the surprising items harboring mercury — a heavy metal very much at large in the Bay-Delta environment and fast accumulating in the food chain. Efforts to thwart this contamination are heating up, as government and stakeholders up and down the Estuary wrangle over objectives, science and regulations.

"It's nasty stuff," says Phil Bobel of the Palo Alto Water Quality Plant. "It's a water pollution problem that people respond to more strongly because of the human contact hazards."

Mercury as a deadly pollutant made its most dramatic appearance back in the 1960s in Minamata, Japan, where enough got into the local food chain that it actually poisoned the populace and caused frightful birth defects and symptoms like those of MS. More recently, mercury has been found in Bay fish at levels high enough to lead the state to issue health warnings for consumers.

Where is it coming from? Not only is it hidden in household items like lap top switches and thermometers, but also in our dental fillings and wrinkle creams. Regulators guesstimate that over 1,700 kilograms per year enter the Bay watershed (see table p.6). One big chunk comes sewage, urban runoff and atmospheric fallout from furnaces, crematoria and cement manufacturing. Another chunk flows downstream from decommissioned mines in the watershed while a third chunk lurks in Bay bottom deposits of old hydraulic mining debris (miners used mercury to extract gold and silver from their ores).

Scientists say at least 400 million cubic meters of this debris ended up in San Pablo Bay. According to bathymetric models crafted by the U.S. Geological Survey's E Jaffe and Richard Smith, underwater erc is fast exposing about 100 square kilom of the debris up to five meters thick. "W talking hundreds of tons of mercury at c near the surface of the Bay floor and in contact with the ecosystem," says Jaffe.

Most of this was introduced into the environment as what's called elemental mercury, one of four kinds absorbed into ecosystem in differing degrees. Elementa and reactive divalent mercury (Hg^{2+}) bo convert into the most dangerous and "bioavailable" form, known as methyl mercury, at a faster rate than cinnabar — mercury sulfide in mine runoff. What kinc environments and conditions promote mercury methylation are questions scienti now wish to explore. But one thing they c know is that bacteria in marshes along rive and bayshores spur metnyiation.

"With some pollution problems the bes thing to do is let natural processes remov but not in this case," says Jaffe. "Mercury moving target."

With the marsh-ringed, debris-strewn shallows of the North Bay such a potential breeding ground for the bad stuff, it's no wonder that environmentalists have been raising Cain about mercury in local sewage discharges. To date, BayKeeper has appea four North Bay discharge permits, both or mercury and other contaminant issues.

The latest of these permit wars flared th May, when the S.F. Regional Water Quality Control Board re-issued Novato's NPDES permit but temporarily increased the amount of dissolved mercury the treatmen plant is allowed to discharge from 0.03 to 0.052 parts per billion. The Board then gav Novato seven years to comply with a tougher 0.025 final limit.

Reasons for allowing the increase, according to the Board, were that the old limit was based on since invalidated state

continued page

VOLUME 8, NO. 4 AUGUST 199

Attachment "AA"

MERCURY CONTINUED

objectives rather than on the region's current Basin Plan, and that within the next five years the Board would have a new improved regulatory approach to plug into the equation.

In the meantime, the limits currently in the permit include a new mass mercury limit based on prior performance. Keeping a growing bedroom community to existing performance and giving them a monthly cap is a disturbing idea to many dischargers. "It's a new concept, and one that has our industry very worried, because if you set the mass limit low enough, it's a growth control, which should be the purview of regional land use planning not water quality regulation," says Novato's Tom Selfridge. "We can live with the mass limit in our permit, but we don't like the precedent."

Environmentalists, meanwhile, don't think the North Bay permits go far enough and have accused the Board of backsliding from tougher limits and allowing potential increases in the area's mercury load. "The old myth is that mercury is just a historic legacy of Gold Rush days, and that there's nothing we can do about," says Mike Belliveau of Just Economics for Environmental Health. "But having so much in the system already means we have to crack down harder on what's ongoing. We're long past due to get rid of mercury containing products, especially where alternatives already exist for them."

Palo Alto's sewage plant has proved this can be done. Last year it invited its community to turn in their old mercury thermometers for a coupon good for a digital fever detector. The plant's Phil Bobel says that while the actual reductions in load may be small — only 1,000 thermometers turned in within 18 months — the public awareness value has been great. "It's a way to communicate with the public about something they can understand, and give them something they can do. People come in actually excited to be turning in their thermometer." (Ironically, the recycled thermometers are made into new ones.)

Palo Alto has also asked hospitals and labs to come up with strategies to find substitute equipment for pressure-sensing and other devices containing the offending metal, and found them eager to try. Breaking one mercury thermometer in the wrong place can mean a $500-$1000 hazardous waste clean up, he says. Palo Alto has also conducted a thorough review of sources of mercury to the wastewater entering its treatment plant, and also discovered that the unregulated smoke produced by crematoria may contribute on the order of 100 pounds of mercury per year (via the volatilization of dental fillings). Contemplating possible control strategies — since there's no real technology yet to filter out mercury "smoke" — boggles the mind, if not the soul.

But a certain amount of soul searching may be required if traditionally at-odds dischargers, environmentalists and regulators are to come to agreement on a regional strategy for reducing mercury. To this end, the S.F. Regional Board began work to set a total maximum daily acceptable mercury load (TMDL) for the entire region last year, which is scheduled to complete by 2004. The Central Valley Regional Board is on a similar TMDL track.

"The TMDL is the answer to everyone's questions," says the S.F. Board's Shin Roei Lee. "When it's done, everyone will get their fair share of the waste load."

"The Novato permit continues our trend over the past year of reissuing permits that focus less on compliance with a 'number' and more on ensuring that dischargers take the responsibility to reduce loadings of critical constituents to the maximum extent possible," adds another Board staffer, Bruce Wolfe. "We want them to quit operating in a vacuum and work with other dischargers to coordinate monitoring, and with us to develop an understanding of what their discharge means in their watersned."

Such an understanding should come from the newly-formed, 50-member, stakeholder-based Mercury Watershed Council launched by

continued page 6

BURNING

SUMMER NO VACATION FOR SMELT

Nature, California's relentless thirst and human error conspired to make the early summer of 1999 a particularly deadly one for Delta smelt, creating a textbook example of the hazards facing efforts to protect wildlife and simultaneously supply water to farms and cities.

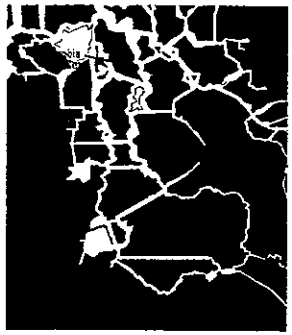
Cal Fish & Game scientists are reviewing their data, trying to find out why so many of the threatened fish lingered for so long within reach of the state and federal pumps in May, June and July, leading to high entrainment levels and a month-long slowdown at the pumps that had water officials and farmers biting their nails and environmentalists calling for a complete shutdown.

According to Fish & Game's Heather McIntire, there have been large takes at the pumps before, although they usually occurred in dry years, when the smelt's spawning habitat in fresh water areas of the Estuary is limited to the Delta and upstream areas. "They may have stayed because the Delta water was cooler than normal this year, or their preferred food was more abundant here," she says.

The pumps hit the take limit in late May, leading U.S. Fish & Wildlife to restrict pumping to less than 3,500 cfs (from the usual 6,000 to 8,000 cfs). As a result of the cutbacks San Luis Reservoir, where heavy spring flows would normally have been stockpiled during this period, had to be drawn down to supply San Joaquin Valley farmers and Silicon Valley industries, raising the specter of water shortages later this summer. And despite the cutbacks, "more than six times the legal allowable take was entrained at the facilities in May and June, and twice the legal take in July," says McIntire.

In late June, as calls from water users grew increasingly frantic, "the smelt began moving away in the right direction," says U.S. Fish & Wildlife's Pat Foulk, and the agency granted permission to ramp up pumping. But a clean getaway for the little fish was not in the cards: three weeks later wildlife agencies discovered that a temporary barrier at Grant Line, required by permit to remain open while Delta smelt salvage is high, had been inadvertently closed. With the barrier closed, explains McIntire "the hydrodynamics of the south Delta reverse direction and pull fish toward the pumps from Turner and Columbia cuts." McIntire says the specific impact of the barrier closure is unknown, as is the overall effect of the summer's events on the total smelt population. Contact Heather McIntire (209)948-7087 CH

SOUTH DELTA PUMPS AND WATERWAYS



MERCURY CONTINUED

the Regional Board this March, if everyone stays at the table. The Council's job is to advise on the TMDL proposal, to study options for trading loads among dischargers, and to explore the realities of "virtual elimination" of mercury from the system. To date, the Council has produced a slim ream of research — most notably a list of mercury sources and pollution prevention methods, and a survey of how trading programs work in other states.

"It makes sense for everyone to work on sources they can do something about, using the low-hanging fruit principal — namely, do the things that are easiest and most inexpensive first," says Palo Alto's Bobel.

Many dischargers think that more treatment, where the mercury reduced may measure in the nanograms, is much less cost-effective than reducing the pounds and pounds coming out of the mines, or the tons lying on the Bay bottom. Public education, meanwhile, remains an important option but one whose impacts in terms of mercury reduction are hard to quantify.

Measuring gains and losses could be equally tough in the arena of runoff pouring into our rivers and bays from cities and towns. "If a lot the mercury we're seeing is from urban stormwater, then municipalities are going to have to get aggressive about finding sources," says veteran stormwater manager and consultant Roger James. "But what if the biggest sources turn out to be global, third world aerial emissions? Should reducing that ultimately become the responsibility of the discharger, since its coming out of their pipe?"

Some of these issues may be resolved via a proposed banking system that would give mercury credits and debits to dischargers who've exhausted their own local ability to reduce mercury but might be able to pay for reductions elsewhere. To this end, the Council is trying to develop a mass load trading system to complement the TMDL. Key issues for any such program are who can participate, how big will the trading area be (can Bay dischargers trade with Central Valley ones?), when does it kick in (after discharge levels exceed permit requirements? Or only when all local reduction efforts are exhausted?), how to measure gains, and how to make sure ecological impacts aren't just shifted elsewhere.

"If North Bay dischargers buy credits to clean up Cache Creek, it provides no benefit for the immediate Napa River environment, and for those Latino farmworkers fishing in the river," says Mike Belliveau. Yolo County's Cache Creek is a known mercury hot spot in the Delta watershed.

How have other states dealt with pollutant trading questions? Council intern Katy Chamberlain recently investigated ten existing programs in Colorado, Florida, North Carolina and the Great Lakes. Most were focused on nutrients rather than toxics, and very few have been established long enough to evaluate their effectiveness. But Chamberlain did glean some wisdom. According to a memo she wrote to the Council: "The truly successful programs are not only clearly outlined and strictly regulated by the government, but also have a baseline from which emissions must not increase. If a discharger's emissions are over loadings allocated by their NPDES permits, the discharger may buy credits generated through the regulatory agency *before* the transfer of credit. This reduction in pollutant loadings before the trade is integral to successful trading, otherwise load reductions can be uncertain. To prevent hot spots and high concentrations, trading must only be performed within smaller watersheds."

Despite all the data collected, lists made, and policy drafted, the Board's Lila Tang says "no one is shaking hands and hugging yet." Things could get more painful soon, if similar conflict-ridden efforts to build South Bay consensus on copper and nickel reduction strategies are any indication.

MERCURY LOADS TO SAN FRANCISCO BAY

Bay sediment deposited	410 kg/yr
Bay sediment eroded	190 kg/yr
Local stream input	2.5 - 8 kg/yr
(to) Ocean dissolved	60 kg/yr
(to) Ocean particles	430 kg/yr
POTWs	10.7 kg/yr
Industrial	20 kg/yr
Mudflats & wetlands	18 kg/yr
Urban non-point runoff	470 kg/yr
Direct atmospheric deposition	3-8 kg/yr
Net influx from watershed	175-208 kg/yr

Source: San Francisco Regional Water Quality Control Board, 1998

Part of the problem for would-be consensus builders is the current regulatory vacuum on mercury. "Regulations are behind the times on mercury, partly because it's an arena that's so litigious. It's easy for dischargers to retard the regulatory process," says U.S. Fish & Wildlife's Steve Schwarzbach, whose agency recently issued a biological opinion on the proposed California Toxics Rule.

The rule — to be released in draft form by U.S. EPA this fall — will apply everywhere there aren't already regional numbers in place (the Central Valley, for example), and become a default when local objectives are challenged. But the rule's 50 parts per trillion mercury criteria is "orders of magnitude" off the 2 ppt Schwarzbach would like to see to protect fish and wildlife from reproductive and health effects.

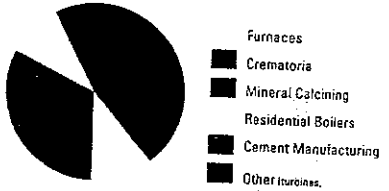
"The mercury objective should be the guiding light, the regulatory end point, which says this is where we need to be," he says. "If you've got the wrong destination from the start, it doesn't help."

No statewide numbers are in place either — California's water quality standards were remanded by a lawsuit in 1994 and never reinstated. Exacerbating this regulatory vacuum, meanwhile, are pending changes in how the feds want mercury levels measured and risks assessed.

Amid all this regulatory uncertainty, however, are two signs of movement on mercury. First, EPA has suddenly cracked down on discharges to water bodies officially listed as "impaired" under the Clean Water Act due to the presence of mercury, copper, dioxin and other contaminants. Both the North and South Bays are officially "impaired."

continued page 7

SOURCES OF AIR EMISSIONS OF MERCURY IN THE SAN FRANCISCO BAY REGION



The following sources also contribute, but quantities are unknown: paint use, abandoned mines, contaminated soils and geothermal power.

PLACES TO GO & THINGS TO DO

WORKSHOPS & SEMINARS

SEPT TUES 14 THRU THUR 16 — PESTICIDE SYMPOSIUM
Topic: The chemistry and fate of modern pesticides
Sponsor: University of Kansas
Location: Lawrence, Kansas
(785)864-4790

SEPT THUR 23 — S.F. BAY DECISIONMAKERS CONFERENCE
Topic: Does the environmental regulatory process serve the public interest?
8:00 AM — 5:00 PM
Sponsor: Bay Planning Coalition
Location: San Francisco
(415)397-2293

SEPT THUR THRU SAT 23 THRU 25 — SOCIETY FOR ECOLOGICAL RESTORATION 11TH ANNUAL CONFERENCE
Topic: Reweaving the World
Sponsors: SER, CALFED, National Park Service, more.
Location: San Francisco
(608)262-9547
www.ser.org/ser99.htm

SEPT SAT THRU THUR 25 THRU 30 — INTERNATIONAL ESTUARINE RESEARCH FEDERATION CONFERENCE
Sponsor: Estuarine Research Federation
Location: New Orleans
(504)280-7395

OCT FRI 8 — WATER SUPPLY AND FISH IN THE SACRAMENTO-SAN JOAQUIN DELTA
Topic: One-day short course presenting the latest information on Delta resource issues and solutions.
8:00 AM — 4:30 PM
Sponsor: U.C. Extension
Location: Berkeley
Cost: $295
(510) 642-4111

OCT WED 20 — WATER ISSUES BRIEFING
Topic: Bay-Delta and Beyond
Sponsor: ACWA
Location: Oakland
(916) 441-4545

NOV TUES 2 — WATER RIGHTS, WATER WRONGS FORUM
Topic: Rethinking California's water rights system and laws.
All Day
Sponsor: S.F. Estuary Project
State Building, 1515 Clay Street, Oakland
(510)622-2465

MEETINGS & HEARINGS

AUG TUES & THURS 18 THRU SEPT 22 — CALFED BAY-DELTA PROGRAM
Topic: Hearings on CALFED draft plan.
6:00 — 9:00 PM
Location: Various
(800) 900-3587

SEPT WED 15 & OCT 22 — FRIENDS OF SAUSAL CREEK
Topic: New action plan
7:00 — 9:00 PM
Sponsor: Aquatic Outreach Institute
Location: Dimond Library, Oakland
(5100 231-9556

HANDS ON

SEPT SUN 12 — CALIFORNIA ENVIRONMENTAL FAIR
Topic: Water quality, river and fishery restoration, endangered species and habitat preservation, agricultural land protection.
Noon — 5:00 PM
Sponsor: Oakland Museum
Location: Oakland
(888)625-6373

SEPT SATURDAYS 25 & OCT 2 — KIDS IN CREEKS
Topic: Interdisciplinary creek exploration and restoration program for educators
9:00 AM — 4:30 PM
Sponsor: Aquatic Outreach Institute
Location: Sunol Regional Wilderness
(510)231-9507

OCT SAT & SUN 2 THRU 3 — COSUMNES RIVER PRESERVE WEEKEND
Topic: Results of Point Reyes Bird Observatory's five-year monitoring project.
Sponsor: Point Reyes Bird Observatory
Location: Cosumnes River Preserve
(415)868-1221, ext 780

OCT SATURDAYS 16 23 & NOV 6 13 — CREEKS, WETLANDS AND WATERSHEDS CONFERENCE
Topics: A series of 12 field trips on topics ranging from water quality and aquatic insect monitoring to nature-based art.
Sponsor: Aquatic Outreach Institute
Location: Various
(510)231-5778

MERCURY CONTINUED

For years, deepwater dischar as Tosco have enjoyed what's c "dilution credit" which allows th assume a certain amount of dilu problem contaminants at the er pipe by the receiving waters. Fo organizations like BayKeeper hav challenging such credits.

As of now, EPA is sending out warning letters that such dilutio will soon no longer be given for and other offenders. This isn't ne just proper implementation of ex law, says EPA's Terry Oda. "If the body itself is already exceeding s we can't give them a credit for d flies in the face of the whole Clea Act concept of not contributing impairment," he says. "We won't them right between the eyes, we they need time to come into com In the interim they can still opera current conditions but in the enc have to meet either the metal cri TMDLs without the dilution credi

The second new regulatory mo mercury came this July, when the Board amended stormwater discr permits for Contra Costa and San counties to improve mercury cont mandate more pollution preventic "Stormwater permits usually only BMPs (best management practice for the first time these permits say counties have to monitor and asse mercury loadings," says the Board Roei Lee "It's putting stormwater p a point source category."

BayKeeper doesn't think the per far enough, however, and is appea them for, among other things, the to control increases in mercury dis from new developments.

Another source that may need t moved into the point source categ the mines upstream, where Bay fin have long pointed when it comes t mercury. Preliminary results of som science confirm the importance of mines, and reveal likely hot spots upstream of the Delta.

The three-year U.C. Davis study investigating Delta tracts flooded inadvertently by storm events over past 75 years to determine if methy mercury distribution and bioaccum. varied with watershed source, salini time since flooding, vegetation and factors.

continued bac

MERCURY CONTINUED

"We were afraid we'd end up with a dull project, and find mercury concentrations uniform everywhere in the Delta," says co-author Darell Slotton."But the news is we found real low spots and real high spots, and the most dramatic high spots so far correlate with Cosumnes River and Yolo Bypass inflows."

It's ironic that one of the Estuary's last remaining wild and undammed rivers, the Cosumnes, should have some of the highest mercury concentrations for the very same reason (dams trap and contain mercury-laced sediments), says Slotton. The Cosumnes' small flows and gentle gradient also play a role is encouraging the mercury to hang around, he adds. The Yolo Bypass, meanwhile, conveys flows from that known mercury bad guy: Cache Creek.

One surprise, says Slotton, was to find higher levels of mercury upstream of the city of Stockton than below it on the San Joaquin River: "We thought we'd see a signal from the city, especially with all its organic matter (sewage) and low oxygen level problems. All these factors should contribute to mercury methylation, but go figure. It looks like more is coming from the mines upstream on the Merced and Stanislaus than from the city."

The study's authors conclude that regions demonstrating enhanced bioavailability may not be the most desirable locations for large-scale wetland restoration (too bad the Cosumnes is the Miss America of the restoration universe). Further research on upstream mercury sources and methylation is planned courtesy of a $3.8 million CALFED grant, part of the biggest mercury research project undertaken nationwide since similar projects in the Great Lakes and Everglades.

The conclusions of the U.C. Davis study are echoed by Jaffe's and Smith's mapping of North Bay mining debris, spots planners should be beware of when restoring wetlands or dredging. Either activity could increase the ecosystem's exposure to mercury and mercury methylation. "If you flood dry soils to make a wetland, we know that there's an instant pulse of methyl mercury that can last up to a decade," says the Geological Survey's Sam Luoma.

So with mercury in our air, water and land, with little regulatory guidance in place, and with only fledgling science at our fingertips, there seem to be more questions than answers available to those trying to purge our small estuarine universe of this slippery silver poison.

"Science may not give us all the answers and our environmental community won't wait," says the Board's Lila Tang. "So our strategy's going to have to be based on our best judgment, and the work of our stakeholder Council. Luckily mercury has a lot of potential in the pollution prevention arena, unlike dioxin which is a by-product of many processes and used less purposefully. If we start reducing mercury use now, our grandchildren may see some benefit." ARO

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21-1. The commenter's concern regarding land application of biosolids on ground and surface waters which naturally flow into or eventually are discharged into the Sacramento/San Joaquin Delta are noted.

21-2. Based on conditions specific to California, the proposed GO is more restrictive than the Part 503 regulations. Additionally, the commenter is concerned about the land application of biosolids to areas that "unreasonably and unnecessarily jeopardize the public and the environment." The EIR was prepared to evaluate the effects of land application of biosolids on the public and the environment. The proposed GO also was designed to separate the land application of biosolids in sensitive areas (the exclusion areas), such as the jurisdictional Sacramento-San Joaquin River Delta from the rest of the state. Any proposals for land application in the exclusion areas would be subject to further environmental evaluation under CEQA.

21-3. The draft EIR concluded that the land application of biosolids would not result in significant and unavoidable environmental impacts. Furthermore, the draft EIR concluded that, with mitigation measures, all impacts would be considered less than significant. The commenters opinion regarding the conclusions of the EIR and the selection of the environmentally superior alternative is noted.

21-4. As noted in the comment, SWRCB staff did provide special consideration to the Delta by excluding it from coverage under the proposed GO. Also, the proposed GO does address issues such as flooding, surface water and groundwater. The potential impacts discussed for the statewide program are applicable to lands adjacent to and upstream of the Delta. With proper implementation of the proposed GO provisions and the mitigation measures in this EIR, offsite and downslope significant effects are not anticipated.

21-5. The commenter indicates that the draft EIR "fails to provide additional 'safety buffers' or 'uncertainty buffers' to protect the environment and the public from the extensive gaps in our scientific knowledge in this area."

The commenter cites a study with a quote from a paper by Straub, T. M., I. L. Pepper, and C. P. Gerba, 1993 entitled "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge." This quote will be added to page 5-5 after the first paragraph, before the heading Emerging Pathogens of Concern:

> As an example of the unavoidable uncertainty associated with the impacts from pathogens in biosolids, the authors of the study, "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge," explain the following:

> It should be recognized that the list of pathogens is not constant. As advances in analytical techniques and changes in society have occurred, new pathogens are recognized and the significance of well-known ones changes. Microorganisms are subject to mutation and evolution, allowing for adaptation to changes in their environment. In addition, many pathogens are viable but nonculturable by current techniques [cite], and actual concentrations in sludge are probably underestimated. Thus, no assessment of the risks associated with the land application of sewage sludge can ever be considered to be complete when dealing with microorganisms. As new agents are discovered and a greater understanding of their ecology is developed, we must be willing to reevaluate previous assumptions.

SWRCB staff is aware of these uncertainties and has therefore developed a conservative approach to regulating land application of biosolids. SWRCB staff will reevaluate its regulatory program as research provides additional information on risks associated with pathogens.

21-6. The comment presumes there are "gaps and shortcomings" in EPA's Part 503 regulations. This statement refers to Cornell Waste Management Institute's report, "The Case for Caution, Recommendations for the Land Application of Sewage Sludges and An Appraisal of the US EPA's Part 503 Sludge Rules." In developing the Part 503 regulations, EPA conducted a comprehensive risk assessment based on decades of research on hundreds of different pollutants. The risk assessment provided sufficient conservative measures to protect against adverse impacts to humans and the environment. While developing the risk assessment, it was determined that heavy metals clearly posed the greatest risk of all potentially toxic pollutants; therefore, limits for these metals were created.

As part of the EIR preparation for the proposed GO, current information was reviewed to determine if there have been any significant scientific data that could refute EPA's findings. Cornell's study was examined and it was determined that there is still a lack of sufficient scientific information to change the metals limits or add any additional limits for other pollutants other than molybdenum. Cornell's study referenced metals limits set in other countries that are more restrictive than those listed in the Part 503 regulations. Limits set in other countries are based on policy, not on a scientifically based risk assessment (see Master Response 12). The proposed GO goes beyond the Part 503 regulations and provides other measures to reduce the risk for public health impacts associated with the land application of biosolids.

21-7. See Response to Comment 21-6.

21-8. This comment assumes that the EPA did not have sufficient information to adequately evaluate the risk of the land application of biosolids. Dioxin and numerous other

compounds were evaluated in the EPA risk assessment. Although there was limited information at that time on dioxin and some other chemicals, it appears that EPA offered sufficient conservative measures as part of the Part 503 regulations to protect human health and the environment. More information is now available on dioxin and EPA is using this data to develop limits for dioxin that can eventually be incorporated by the proposed GO if deemed appropriate by SWRCB staff. The EPA's proposed rule on dioxin was published in December 1999. As the EPA deems necessary, other pollutants may be regulated in the federal rules. These too will be considered by the SWRCB on a case by case basis.

In the case of dioxin, dioxin is everywhere, including in the food that humans consume. The most substantial source of dioxin to humans is from meat products. At best, biosolids have only a minor contribution of dioxin to soils. Air deposition has, by far, the greatest contribution of background dioxin levels in soils. Furthermore, dioxin levels in the U.S. are continuing to decrease over the years.

21-9. Comment noted; however, SWRCB staff respectfully disagrees with the commenter's conclusions regarding the need for more restrictive setback distances to the listed water resources. However, SWRCB staff does not disagree that increasing the setback distances would reduce potential impacts to water quality. The recommended measures would limit location and probability of impacts occurring. However, these measures would not change conclusions reached pursuant to CEQA guidelines for disclosing and identifying the significance of environmental impacts. As described in Master Response 13, analysis of potential environmental impacts to surface and groundwater resources were based partially on the risk assessments performed for development of the Part 503 regulations, additional conservative restrictions and prohibitions for land application under the proposed GO, and presumption that RWQCB staff will ensure that each biosolids application project adequately complies with the proposed GO and other water quality regulations.

In addition, Master Response 14 describes the rationale for analysis of the proposed GO's level of protection to groundwater resources from all potential contaminants. Recommended increases in setback distances to groundwater resources would be overly restrictive and inconsistent with comparable regulations for similar materials discharged from confined domestic livestock facilities, residential septic systems, agricultural fertilizer and pesticide use, areas where reclaimed treated wastewater is applied, and siting rules for landfills. Master Response 17 describes the rationale for evaluating impacts to surface waters under the provisions and protective measures in the proposed GO based on the inherently low probability of occurrence in such areas.

21-10. The SWRCB staff respectfully disagrees with the comment recommending restrictions to land applications of biosolids regarding minimum depth of groundwater. Master Response 13 describes the basis for analyzing potential impacts to groundwater from biosolids application under the proposed GO in relation to the risk assessments conducted for the Part 503 regulations. In addition, Master Responses 15 and 16 describe why risk

assessments conducted for the Part 503 regulations were extremely conservative with respect to depth to groundwater.

21-11. The commenter presumes that "preferential flow paths" to groundwater provide a more conservative basis for the water quality impact analysis than that presented in the EIR. This presumption is not correct. See Master Response 16 for a detailed description of why preferential flow paths would not substantially affect the risk assessments of the groundwater pathway conducted for the Part 503 regulations.

21-12. Master Response 15 describes why the analysis of water quality impacts to groundwater from biosolids application was not dependent on a provision in the proposed GO for minimum vertical separation between biosolids application areas and the groundwater table.

21-13. The comment references two studies conducted that further criticize EPA's presumption, as used in the Part 503 regulations, that metals cannot readily leach in soils. This presumption is also implied in the proposed GO. While these studies show that metals movement in soil can be higher under certain conditions, there is still a lack of conclusive scientific evidence that sludge applied metals readily leach through soil.

The comment's referenced study (Camobreco et al. 1996) showed that metal mobility is higher in undisturbed soils, but the author stated that ". . . even with preferential flow, the metals still interact with the soil binding sites on the preferential flow paths." The author also stated that "While this study demonstrates that preferential flows paths in undisturbed soil make a considerable difference when considering solute transport through soil, it may not be directly applicable to sludge-applied metals. Metals applied in this experiment were soluble metal salts, whereas metals in sewage sludge would not necessarily react in a similar matter since the high organic content of sludges retains metals strongly."

The argument for increased metals mobility was based on the fact that some metals were unaccounted for in the metals balance. The argument also assumes that the fraction of metals that are not accounted for in the soil has leached. However, it has been shown that all metals in the soils cannot be extracted by conventional laboratory methods because of metals complexing in the soil. Conventional metal extraction methods used did not fully recover all the metals in the soils (Dowdy et al. 1991).

The comment also presumes that the presence of preferential flow paths in soil were overlooked by the SWRCB staff and may invalidate the environmental impact analysis conducted for the EIR. As described in Master Response 14, the analysis of potential impacts to groundwater under the proposed GO were primarily based on the protections afforded for nitrate contamination, which generally moves more readily in the soil-water column than trace metals or SOCs, for which extensive risk assessments were performed for the Part 503 regulation development process. The Part 503 risk assessments found that the groundwater pathway was not limiting for any trace metal or SOC in the final adopted

pollutant limits (Master Response 13). In addition, Master Response 16 describes why preferential flow paths do not necessitate additional evaluation on the part of the SWRCB for analysis of groundwater quality impacts in the EIR.

21-14. The relationship between preferential flow paths, lack of GO provisions for minimum depth to groundwater, and the analysis of groundwater quality impacts are summarized in Master Responses 13, 14, 15 and 16.

21-15. See Response to Comment 21-13. The applicability of preferential flow paths to the analysis of groundwater quality impacts is described in Master Response 16.

21-16. The applicability of preferential flow paths to the analysis of groundwater quality impacts is described in Master Response 16.

21-17. The comment addresses the concern over virus movement from biosolids into groundwater by preferential flow. The comment assumes that the biosolids initially contain large amounts of pathogens. Biosolids undergo treatment prior to land application and must meet pathogen reduction requirements in the Part 503 regulations. As a result, land-applied biosolids contain reduced levels of pathogens. For Class A biosolids, to ensure that the biosolids have met the pathogen reduction requirements, the proposed GO requires that the biosolids are tested for fecal coliform as part of the pre application report, and annually thereafter. The pathogen levels in Class B biosolids are low enough that the risk of groundwater contamination of groundwater is less than significant when GO restrictions are complied with.

See Master Response 13 for additional provisions in the proposed GO that are more restrictive than the Part 503 regulations. The applicability of preferential flow paths to the analysis of groundwater quality impacts is described in Master Response 16.

21-18. The analysis of groundwater impacts regarding depth of groundwater and preferential flow paths is described in Master Responses 15 and 16.

21-19. The commenter notes, "the available scientific evidence indicates that viruses have migrated downward through the soil up to 60 feet. In the study entitled, 'Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge,' it states:"

> In contrast (to studies using viruses that are highly adsorbed in soil), Gerba and Bitton (1984) reported that coxsackie B3 virus was able to migrate 18.3 m when sewage effluent was applied to land used for artificial groundwater recharge. Downward migration from sludge-amended soils using viruses that adsorb poorly to soil like Group B coxsackie has not been studied....Only a limited number of virus groups have been studied to date." (See Attachment A to prior comments on NOP, dated December 1, 1998, page 76).

Dr. Charles Gerba, one of the authors of this study, indicated that this study was for sandy soils in which large quantities of water were applied. Viruses are more tightly bound to solids in areas where biosolids are applied and there is not as much water applied to provide a means of transport to groundwater. Also, the referenced groundwater recharge studies have different objectives than biosolids amendment to agricultural areas, that being maximizing the amount of water applied and percolation to groundwater. Agronomic nitrogen application rates will limit the amount of water and potential leaching to groundwater in areas where biosolids are applied due to the limitations related to nitrates.

21-20. The analysis of groundwater impacts regarding depth of groundwater and preferential flow paths is described in Master Responses 15 and 16.

21-21. The analysis of groundwater impacts regarding depth of groundwater is described in Master Response 15.

21-22. Commenter requests that the EIR address the extent to which coxsackie B3 can be present in Class A and Class B biosolids, and how it relates to Comments 21-19 and 21-20.

Coxsackie B3 virus survival in sewage sludges subjected to anaerobic digestion for 24 hours at 35EC was low (>99% reduction). For longer detention times (14 days at 32EC) survivals were even lower (>99.999% reduction) (Eisenhardt et al. 1977). The levels of virus present in digested sludges could be in excess of 1000 viruses/L even if treatment efficiency were 99% (Straub et al. 1993). See draft EIR References for Chapter 5.

Such high destruction in the basic processes used to reduce pathogens in biosolids forms a basis for the development of the Part 503 regulations.

21-23. In addition to pathogen reduction measures, the proposed GO has additional requirements such as setback distances during biosolids application of 10 to 2,500 feet, and waiting periods of 30 days to 36 months to protect against pathogen regrowth over longer periods of time. These measures protect humans against exposure to pathogens. Studies show that the survival rates and regrowth of pathogens in soil are extremely variable depending on several factors (Pepper et al. 1993).

No regulation is immune from irresponsible agencies or individuals. Applying biosolids that do not meet Class A or B requirements is no different from any other negligent practice. The EIR assumes that biosolids application will follow the proposed GO's requirements. Biosolids land application is subject to inspection by the producer as called for in the California Water Environment Association(CWEA) Manual of Good Practice for Land Application of Biosolids, and regulatory agencies, including RWQCBs and County Local Enforcement Agencies.

21-24. Commenter requests that the EIR address the extent to which other viruses with similar characteristics to coxsackie B3 (such as viruses that absorb poorly to soil) are present in Class A and Class B biosolids, and how it relates to comments 21-19 and 21-20.

Few studies have been performed to quantify viruses in biosolids. Efforts to measure viruses in biosolids have only recently been developed and are continuing (Goyal et al. 1984, Smith and Gerba 1982, and Payment and Trudel 1985, all as cited in Yanko 1988). The evaluation of compost quality was one of the most intensive studies done prior to the adoption of the Part 503 regulations (Yanko 1988).

Since the advent of the Part 503 regulations, more studies have focused on the destruction of pathogenic organisms (Huyard et al. [1998], Han and Dague [1997], Han et al. [1997], Watanbe et al. [1997], Volpe et al. [1993], and Aitken and Mullenix [1992]). Thermophilic anaerobic digestion has been evaluated because of the significant advantage of improved pathogen destruction with the potential of meeting the pathogen quality requirements of EPA's Class A biosolids. These studies have focused on bacterial reductions. Viral studies are more difficult to perform.

As alluded to in the Response to Comment 21-23, anaerobic digestion has been very effective in those studies where virus inactivation has been quantified.

New evaluations of thermophilic anaerobic digestion versus mesphilic anaerobic digestion to meet the Class A reduction requirements of the Part 503 regulations have been completed by the East Bay Municipal Utility District (Gabe et al. 1999).

21-25. Commenter requests that the EIR address the extent to which other viruses with similar characteristics to coxsackie B3 (such as viruses that absorb poorly to soil) can move more readily through the soil and how it relates to comments 21-19 through 21-24.

Specifically, commenter wants to know:

- whether viruses and other little-known contaminants and/or which we are not scientifically able to detect or study can move through soil similarly or more easily than coxsackie B3;
- whether viruses like group B coxsackie been studied;
- what virus groups have been studied;
- if these studies considered the preferential flow phenomenon.

The commenter noted, "The literature shows that metals movement through soil is still not well understood. The roles of preferential flow paths and soluble organic matter are

especially unclear." (See Attachment H to prior comments on NOP dated December 1, 1998, page 742).

In regards to this point, Dr. Charles Gerba, co-author of a 1993 paper entitled "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge," responds, "Both column experiments and field studies have shown that biosolid application to land does not result in virus transport to aquifers. Viruses have not been detected beneath biosolid application sites. It appears difficult for viruses to be released from biosolids. Coxsackie viruses are members of the enterovirus group and they are common in biosolids. The methods used in previous field studies were capable of detecting Coxsackie B3 virus; if it was a significant problem it should have been detected in the subsurface. Also, since field studies were conducted on virus migration from land applied biosolids, the issue of preferential flow aiding virus migration was taken into consideration. If it had been a significant issue, viruses should have been detected in the groundwater." (Gerba pers. comm.).

21-26. The commenter asked that the EIR address the issue of "Whether biosolids will be applied to lands which, due to their soil makeup and/or the presence of preferential flow paths, are similarly capable of transferring viruses (and other contaminants) 60 feet below the surface."

In regards to this point, see Response to Comment 21-25.

21-27. As described in Master Response 15, the SWRCB staff disagrees with the presumption that the lack of provision in the proposed GO for biosolids application regarding minimum depth to groundwater would cause groundwater impairment. As described in Master Response 17, flooding presents an increased risk beyond those evaluated for transport of contaminants in the Part 503 risk assessments. However, the probability of flooding on a field receiving biosolids through the GO review process is inherently low such that water quality impairment from such an infrequent occurrence is considered less than significant.

21-28. See Master Responses 13 and 14.

21-29. As described in Master Response 15, groundwater monitoring required for the proposed GO is not relied on as mitigation for potentially significant impacts under CEQA because it does not fully satisfy the requirement to reduce, minimize or avoid the impact. Master Responses 13 and 14 describe the basis for evaluating impacts to groundwater quality. The analysis presumes that biosolids application could occur continuously with normal farming practices designed to comply with provisions of the proposed GO. The Part 503 risk assessment specifically for groundwater was based on more conservative assumptions of biosolids application rates occurring continuously for 20 years (rather than the 15-year period of effect for the GO). This risk assessment assumed a depth to groundwater of 1 meter. Under this very conservative assumption, no significant effects were predicted.

Therefore, monitoring that is adopted on a site-specific basis by responsible RWQCB staff would not affect the degree or extent of potential impacts.

21-30. As stated in Master Response 15, groundwater monitoring required for the proposed GO is not relied on as mitigation for potentially significant impacts under CEQA because it does not fully satisfy the requirement to reduce, minimize or avoid the impact. Therefore, the SWRCB staff disagrees that discretionary changes made by the Executive Officers to required monitoring would necessarily increase the degree of potential groundwater quality impacts. Also see Response to Comment 21-29.

21-31. The discretionary authority that the proposed GO gives to RWQCB Executive Officers regarding groundwater monitoring has not deferred the impact analysis relative to groundwater quality. The EIR gives a thorough consideration of the potential for groundwater contamination in Chapter 3 (see pages 3-29 to 3-37). The discretion given in the proposed GO allows the Executive Officers to determine if groundwater monitoring would provide enough benefit to warrant the cost in specific project situations. Monitoring is not, in itself, proposed as a mitigation for potential groundwater impacts; it is an early detection method that can be used where depth to groundwater and soil conditions indicate it would be advisable. The Executive Officers have RWQCB technical staff to provide the analysis necessary to determine the value of monitoring.

This EIR is intended to provide CEQA compliance for any proposed land application project that meets the parameters in the proposed GO. The RWQCBs have the authority to use individual waste discharge requirements and undertake additional CEQA documentation for any proposed project that may fall outside the parameters of the proposed GO and may not be fully protective of the environment if it were regulated only by the conditions in the proposed GO.

21-32. Comment noted. The draft EIR, page 3-35, last sentence of second paragraph, is hereby revised as follows:

> In areas with shallow groundwater <u>and frequent biosolids application</u>, monitoring is required that would result in early detection if leaching of substantial quantities of pollutants were occurring.

Although trace metals, SOCs, and biological contaminants are not required to be monitored in wells, the more soluble compounds such as nitrate, total dissolved solids, and chloride must be monitored annually. As described in Master Response 15, if monitoring of these contaminants indicates impairment, the RWQCB engineer would then be able to evaluate whether there is a further risk from other less soluble contaminants and adjust future permitting practices to ensure resource protection.

21-33. Metals, pathogens, and organic chemicals travel at much slower rates than the constituents listed for groundwater monitoring in the GO. For this reason, those inorganic salts are the

recommended indicators for measuring potential groundwater effects. This approach is prudent and scientifically defensible. The remaining numbered points discussed in Comment 21-33 are addressed as follows:

1. The proposed groundwater monitoring requires approval by the RWQCB Executive Officer. As stated in the Monitoring and Reporting Program of the GO, "a minimum" of three wells is required. This allows the flexibility to require more monitoring wells for larger sites.

2. Groundwater generally flows at a low rate. Best professional judgment establishes monitoring once per year as appropriate.

3. Monitoring wells are used to determine the gradients of the groundwater flow, including those exerted by potential wells .

4. The fecal coliform test, although not required in periodic testing, will not "detect" other pathogens, but may indicate the presence of such organisms. The inorganic constituents recommended as indicators for measuring potential groundwater effects will sufficiently indicate potential groundwater effects.

5. Tile drains are commonly used in areas where the groundwater is saline. In such cases, groundwater may not be designated as a municipal or agricultural source. However, in cases where tile drains are present and the groundwater monitoring is required, those factors must be weighed at the time the RWQCB Executive Officer is approving the groundwater monitoring system.

21-34. The groundwater monitoring program proposed in the proposed GO was developed and reviewed by SWRCB staff familiar with the latest groundwater quality monitoring protocol; this program has subsequently been reviewed by engineers and technical staff preparing the EIR who are also familiar with the design and implementation of effective groundwater monitoring programs. The SWRCB is the principal state agency responsible for protecting waters of the state to maintain their beneficial uses.

The list of constituents that must be tested for is in the preapplication report. The initial groundwater testing must include a full range of potential contaminants regulated by the GO. Subsequent annual testing relies heavily on monitoring for changes in nitrate, chloride and TDS levels as an indicator of any influence land application might have on groundwater quality. Refer to Master Responses 14 and 15 for a further explanation of this monitoring protocol. RWQCB staff have the authority and technical expertise to dictate the location of this monitoring relative to the land application operation and can propose additional monitoring requirements if deemed necessary to fully protect groundwater quality.

For those sites where groundwater quality monitoring is deemed necessary, monitoring will be required annually as long as the permit is in place. When the permit is withdrawn, the requirement will cease.

21-35. The comment indicates that the EIR lacks scientific information regarding the factors which contribute to horizontal and vertical movement of pathogens and contaminants once they reach the saturated zone (the groundwater aquifer). The commenter requests scientific information regarding these factors and asks:

- # How far and how quickly will the various contaminants and pathogens travel vertically and horizontally in the saturated zone?

- # What factors influence their movement?

- # Will they concentrate near the top of the water table (will some of the pollutants and pathogens float? If so which ones?), or will they continually drive downward due to gravitational forces?

When biosolids are land-applied, the soil and biosolids particles form a filter mat that prevents most large particles from entering the subsurface groundwater. Usually, only soluble and colloidal particles and virus particles, and perhaps small bacteria, can enter the soil while larger organisms (such as helminth eggs) are retained on land (U.S. Environmental Protection Agency 1992). Filtration acts on the bacteria while adsorption retains viruses in the soil.

Vulnerability of a groundwater source to contamination depends on several factors, including the natural watershed characteristics, geology, soil permeability, soil slope and the amount of runoff. Human factors include reservoirs, wells, canals, and irrigation practices, in addition to the quality and amount of biosolids applied to a given site. Because these factors can influence the pathogens' vertical and horizontal movements on a site-specific basis, it is not possible to generalize these rates. Specific factors important to horizontal and vertical movement of pathogens and contaminants include the type of geologic structure and soil characteristics. The geologic transmissivity rating using the DRASTIC rating scale (U.S. Environmental Protection Agency 1987) shows little transport through shale and igneous rock (rated 1-3 on a 10-point scale) while sand and gravel ratings are in the range of 4-9 on a 10-point scale (high numbers indicate greater permeability). Soil permeabilities have been classified from very slow (0-0.6 inches/hour) to very rapid (> 20 inches/hour).

Course sand is the soil medium most conducive to pathogen transport because it is not a good filter medium for bacteria and is a poor adsorbent for viruses (Kowal 1985). For transport to occur from the soil surface to groundwater, there must be a route, such as cracks in the soils caused by dessication or from holes caused by roots, insects or animals, which can allow substantial transport to the subsoil. Subsurface fissured rock or limestone

may also facilitate transport downward. However, there must be free liquid from biosolids application, rainfall, or irrigation water to provide a vertical transport mechanism. Then the depth to groundwater becomes a factor, as does the surface application rates or rainfall amounts (which must be sufficient to reach the groundwater via vertical downward movement). Movement rates will vary with soil type and hydraulic gradient.

Viruses in particular appear to have the greatest potential of all pathogens to migrate to groundwater. However, risk modeling efforts have shown that typically only 1 percent of pathogens present may be transferred to the subsurface and groundwater (assuming it is shallow) (Scarpino et al. 1988). Movement is slow to and within groundwater because the adsorption and desorption processes in the soil impede movement and slow progressive transport downward and laterally. Using saturated sites where wastewater is infiltrated (Gerba et al. 1991) showed that adsorption and/or filtration substantially reduced the density of virus (two-log reduction achieved by 15 feet of soil) when the wastewater was applied at a rate of 2 feet per day on a sandy soil. Biosolids application rates usually result in about two order of magnitude lower water application rates than a wastewater infiltration operation; thus even greater viral soil adsorption would be expected. Maximum survival times for viruses in soils at low temperatures (3 degrees to 10 degrees Centigrade) have been measured at 170 days (Kowal 1985). With the low irrigation and rainfall in California, and resultant low virus transport rates, it is highly unlikely that virus contamination of groundwater will occur.

Considerable efforts are underway to develop programs to protect groundwater users from consuming contaminated groundwater. This has resulted in national programs such as the Well Head Protection Program, Source Water Assessment Programs and comprehensive state groundwater protection programs under the Federal Safe Drinking Water Act, which designate time and distance-related zones which prohibit or limit potential water contaminants. As part of the groundwater disinfection rules being developed by the U.S. EPA, protection criteria have focused on dissolved contaminants and more recently on pathogens, including viruses.

Movement of contaminants and pathogens from biosolids applied soils will be very site-specific. First, the soil acts as a natural filtering mechanism controlling movement. For viruses and bacterial contaminants, soil particle size and the electrostatic forces within the pore water will control their movement vertically. Horizontal movement will be controlled similarly by these factors plus the localized movement of the groundwater. Differential movement is likely in aquifer where the underlying rock is course and unconfined which often occurs on flood plains. Given the siting constraints that the GO places on biosolids land application sites, flood plain application sites are unlikely to pose any problems since they will not be permitted.

21-36. The proposed GO is intended to provide for protection of beneficial uses, including drinking water supplies. Consistency between different State of California regulations is important when considering the rationale for adoption and scientific basis. The SWRCB

believes that the 500-foot horizontal buffer recommended in the proposed GO is sufficient to prevent contamination of drinking water wells by pathogens and chemical contaminants when considered in the context of the other restrictions in the proposed GO dealing with contaminant levels, treatment to reduce pathogens and management practices to prevent water quality and soil contamination. In most counties, the minimum setback distance from septic tanks to domestic wells is 100 feet (Peters pers. comm.); thus, the setback recommended in the GO would provide a level of protection well above that required by most county environmental health departments.

21-37. The commenter notes that the EIR should also bear in mind the extremely low infection dose for many pathogens. The commenter states:

> Significant numbers of pathogens exist in sludge even after stabilization and treatment. If these pathogens can remain viable for extended periods of time, groundwater sources beneath sludge disposal and land application sites may become contaminated. Pathogens may not be significantly inactivated or removed by transport through the vadose zone. Once in groundwater, they may travel significant distances from the site. For viruses and parasites, the infectious dose is low, 1-50 organisms (Gerba 1986). If the concentration of either of these pathogens exceeds 10^3/mL of groundwater, there could be a significant risk of infection on an annual and lifetime basis (Gerba and Rose 1990). (See Attachment A to prior comments on NOP, dated December 1, 1998. Hazards, page 85).

University of Arizona microbiologist and researcher Dr. Charles Gerba, whose work was cited and who has undertaken extensive studies of sewage sludge and biosolids land application sites, replies:

> Both column experiments and field studies have shown that biosolid application to land does not result in virus transport to aquifers. Viruses have not been detected beneath biosolid application sites. It appears difficult for viruses to be released from biosolids. Coxsackie viruses are members of the enterovirus group and they are common in biosolids. The methods used in previous field studies were capable of detecting Coxsackie B3 virus and if it was a significant problem it should have been detected in the subsurface. Also, since field studies were conducted on virus migration from land applied biosolids, the issue of preferential flow aiding virus migration was taken into consideration. If it had been a significant issue, viruses should have been detected in the groundwater (Gerba pers. comm.).

21-38. Master Response 17 provides additional information regarding the evaluation of impacts to surface waters under the provisions and protective measures in the proposed GO, including the potential for impacts from flooding.

21-39. Master Response 17 provides additional information regarding the evaluation of impacts to surface waters under the provisions and protective measures in the proposed GO, including the potential for impacts from flooding. SWRCB staff does not dismiss the comments of EPA regarding its analysis of risks associated with biosolids application in floodplain areas. It is the position of the SWRCB staff that RWQCB staff receive ongoing training in the proper methods of evaluating and issuing waste discharge requirements given site-specific information that would be required in the Pre-Application Report; the proposed GO also provides a specific control for application within areas subject to significant erosion from runoff or flooding. Therefore, implementation of biosolids application projects under the proposed GO would pose a low risk to water quality because of washout from flood-prone areas.

21-40. Master Response 17 provides additional information regarding impacts to surface waters under the proposed GO's provisions and protective measures, including the potential for impacts from flooding.

21-41. See Master Response 13 for a description of the conservative risk assessment process conducted for the Part 503 regulation process, assumptions for evaluating potential water quality impacts to surface resources in the EIR, and reasons why the identified impacts were considered less than significant.

The comment is not correct in stating that only nine chemicals were evaluated. The risk assessments evaluated seven trace metals and 10 SOCs; however, EPA determined that regulations were not necessary for all the SOCs. The risk assessments determined that the concentrations for the metals were limited by environmental pathways other than the surface pathway; and the limiting concentrations of metals were much higher than for other pathways. The risk assessments for several trace metals (chromium, copper, lead and nickel) indicated that application could be unlimited and still pose very little risk of contamination. Because limiting concentrations of trace metals were lower for other pathways, biosolids application at those rates would further reduce the risk of contamination from the surface pathway. For example, the annual application of mercury is limited to 17 kilograms per hectare (kg/ha) to prevent contamination from the pathway of a child eating biosolids, whereas application of up to 1100 kg/ha of mercury could occur and still protect the surface water pathway. Biosolids application of 17 kg/ha mercury equates to a ratio that is 65 times lower than what is considered protective of the surface water pathway. This ratio is larger for all other trace metals.

SWRCB staff does not dispute specific arguments against the EPA risk assessment process of the surface pathway, based on other research studies found during the EIR scoping process. However, the extensive EPA Part 503 regulation development process was based on the combined experience, research and judgement of many professionals knowledgeable of waste management processes. SWRCB staff believes conservative factors in the Part 503 regulations and additional protective measures in the proposed GO provide substantive support of the EIR's impact conclusions.

21-42. The proposed GO prohibits direct discharge of biosolids into waters. Biosolids application projects under the proposed GO would have to maintain minimum setback distances from surface waters and areas of gully erosion or washout. These features must be documented on the Pre-Application Report. The SWRCB staff is confident that RWQCB staff have sufficient training, data resources, and review and enforcement authority at their disposal to carefully determine if a project would comply with these provisions. RWQCB staff can also reject a project, or request modifications to bring the project into conformance, or require individual WDRs if protective measures are not included that would prevent direct discharge.

21-43. Master Response 13 describes the basis for analysis of potential surface water quality impacts in the EIR and conservative factors in EPA's risk assessments conducted for the Part 503 regulations. Toxicity is generally associated with trace metals and SOCs, for which risk assessments were specifically conducted for the Part 503 regulations. Therefore, SWRCB staff believes the proposed GO will protect water quality standards for toxicity. If, however, any contradictory evidence becomes available that indicates toxicity was occurring because of land application of biosolids, the SWRCB could modify the GO program to reduce the potential adverse effects from toxicity.

21-44. Master Responses 13 and 17 generally describe the basis for the analysis of potential surface water quality impacts under the proposed GO. Responses to Comments 21-39, 21-41, 21-42, and 21-43 further address the analysis of surface water quality impacts. SWRCB staff believes the evidence supports the EIR's conclusions that risk to surface water quality impairment from biosolids application is sufficiently low, additional protective measures are included, and RWQCB staff have authority to require individual waste discharge requirements for any application project that they believe would not conform to the GO provisions. This ability for individual review includes consideration of a proposed land application site relative to areas of washout or gully erosion where materials could be carried offsite.

21-45. As described in Master Response 13, the Part 503 regulations were developed with several conservative assumptions regarding potential fate and transport mechanisms of contaminants to surface water. Response to Comment 21-39 also describes the basis for SWRCB staff opinions regarding the role that professional training of RWQCB staff and discretionary authority have in reducing potential impacts from typical waste application projects. Those responses are applicable to the analysis of water quality effects from exposure of biosolids application sites to stormwater runoff and irrigation water. SWRCB staff believes the evidence supports the EIR's conclusions that risk to surface water quality from biosolids application is sufficiently low, additional protective measures are included, and RWQCB staff has authority to require individual waste discharge requirements for any application project that they believe would not conform to the provisions of the proposed GO. RWQCB staff routinely evaluate effects of stormwater discharges in association with National Pollutant Discharge Elimination System (NPDES) permitting processes and are

trained to properly evaluate potential exposure and contamination problems associated with biosolids application projects. Irrigation water poses no additional threat to water quality, since Part 503 regulations risk assessments were extremely conservative regarding the surface water pathway exposure route.

21-46. Master Response 13 generally describes the basis for the analysis of potential surface water quality impacts in the EIR and conservative factors in EPA's risk assessments conducted for the Part 503 regulations. See Response to Comment 21-45 for SWRCB response to potential effects of irrigation water and stormwater runoff.

21-47. SWRCB staff does not dispute that biosolids application projects have the potential to contribute small amounts of organic matter and total organic carbon (TOC) to water in the Delta and that this material could be a factor in the formation of trihalomethanes, which is a concern at drinking water treatment plants. The increase in trihalomethane concentrations in treated (chlorinated) drinking water is related to the TOC concentrations. Because biosolids will only be applied to carefully selected lands outside of the Delta, the effects of the biosolids on Delta TOC concentrations will be very small relative to the natural (vegetation) and agricultural (crop residues and peat soil oxidation) sources of TOC. Furthermore, the proposed GO requires specified setbacks from water bodies and the land application of biosolids in the Delta is not allowed under the proposed GO (an individual permit must be issued and further CEQA analysis would be required). SWRCB staff does not believe that the land application of biosolids under the proposed GO would be a significant contribution of TOC to Delta waters, individually or cumulatively, due to the GO's numerous requirements.

21-48. See Response to Comment 21-47.

21-49. Master Response 13 generally describes the basis for the analysis of potential surface water quality impacts in the EIR and conservative factors in EPA's risk assessments conducted for the Part 503 regulations. The controls in the Part 503 regulations and the proposed GO's additional controls are deemed adequate to protect the surface waters of the state from individual site and cumulative contributions of pollutants contained in biosolids. The soil medium and the required agricultural practices are a buffer and binder for the small amounts of heavy metals and other pollutants that are allowed to be present in biosolids applied to the land. The Clean Water Act has provisions that the SWRCB is using to assess cumulative or watershed-scale effects on water quality (total maximum daily load, or TMDL, provisions). The TMDL program generally consists of identifying contaminant sources in a watershed that has impaired water quality, determining reductions in contaminant loading necessary to improve the water quality to acceptable levels, and allocating these, in mass emissions, among the various discharges to improve water quality. Biosolids application projects could be subject to the TMDL process in any watershed that has a TMDL program.

21-50. The commenter notes that the EIR has failed to adequately investigate, document, discuss and analyze the potential for the numerous pathogens in Class A and Class B biosolids to enter the ground and surface waters, the air, or the land in the vicinity of the application sites.

The SWRCB staff disagrees with the comment. The information in the draft EIR and response to comments adequately discloses what is known about the potential for various types of pathogens to enter ground and surface waters, the air or soils at or near biosolids application sites.

21-51. There have been extensive reviews of the scientific literature and research supported by the EPA in developing the Part 503 regulations and in ongoing work to provide guidelines and methods for analyzing and managing biosolids. With regard to pathogens, a third edition of the document "Control of Pathogens and Vector Attraction in Sewage Sludge" will soon be published (James Smith, pers. comm.). This document and its predecessors (U.S. Environmental Protection Agency 1992) have provided specific treatment methods for meeting the Part 503 regulations and how to test for various pathogens in sludges. The research in this area has been used to develop the proposed GO controls on pathogens in biosolids. The potential for transport of pathogens to water, air, and soil has been thoroughly considered in the EIR (see Chapters 3, 4, 5 and 10).

21-52. The pathogen regrowth issue is discussed in the Response to Comment 10-4.

21-53. See Response to Comment 10-4.

21-54. The commenter believes the EIR should "also bear in mind and take into consideration our current inability to effectively detect pathogens." Comment noted; however, methods have improved for the detection of pathogens in the environment, including emerging pathogens such as adenovirus. While additional studies would confirm survival of these organisms during biosolid treatment and in the environment, existing information does not indicate that they would persist significantly longer than studied enteric pathogens. Current guidelines regarding biosolid treatment and land application are conservative regarding pathogen die-off and reduction in treatment. See Master Response 15 for additional information about microbial monitoring.

With the requirement for groundwater monitoring if the depth to groundwater is less than 25 feet, the RWQCBs will be able to determine if chemical contamination occurs. If contamination is eventually detected, additional testing might be proposed to determine if pathogens are present in groundwater at depth. To date, this has not been an issue of concern at biosolids application sites.

21-55. See Master Response 8.

21-56. The issue of the generation of pathogenic aerosols from biosolids land application was addressed in the draft EIR on pages 5-36 and 5-37 and in Appendix E of the draft EIR. Further discussion of the issue of worker exposure to aerosols was addressed in the Response to Comments 15-1, 15-2, 40-2 and 44-12. See discussion under Response to Comment 40-2 for a description of Mitigation Measure 5-3, which recommends that workers involved in the mixing, loading or spreading operations be provided respirators or dust masks for added protection to reduce potential exposure. The setbacks proposed in the proposed GO are not based on specific modeling results, but are general and designed to provide an adequate buffer between land application activities and various beneficial uses.

21-57. The commenter cites research reported in a study entitled "Mobility and Solubility of Toxic Metals and Nutrients in Soils Fifteen Years After Sludge Application" by McBride (1995), to state his view of significant potential short-term and long-term impacts on soil productivity from biosolids land applications, and requests further discussion and documentation of this issue.

The SWRCB staff has reviewed scientific articles on potential land productivity impacts from incorporation of biosolids containing low levels of metals, including the article cited. This article's author (McBride) was particularly concerned over the Part 503 Regulations' allowable loading limits on the typically acidic soils of the northeastern United States, and further documented the concern over biosolids applications to acidic soils in the publication by Cornell Waste Management Institute entitled "The Case for Caution: Recommendations for Land Application of Sewage Sludge and an Appraisal of the U.S. EPA's 503 Sludge Rules" (Cornell Waste Management Institute1997). As the commenter notes elsewhere in the comment letter, there remains some scientific controversy over this issue.

One of the most thorough reviews of this issue was completed by the National Research Council (NRC) in 1996, in the publication entitled "Use of Reclaimed Water and Sludge in Food Crop Production" (National Academy of Sciences 1996). This publication included a review of the 1995 McBride paper. The NRC did not conclude significant impacts on land productivity from biosolids associated metals additions, except perhaps on some types of acidic soils.

The USDA Agricultural Research Service recently analyzed this issue and reported its findings in an article entitled "Long-term Effects of Biosolids Applications on Heavy Metal Bioavailability in Agricultural Soils" (Sloan et al. 1996). It concluded that biosolids-applied cadmium was still in a form that is easily extracted from soil and readily available for uptake by lettuce more than 15 years after application. The other metals evaluated, including chromium, copper, nickel, lead, and zinc, were not found to be more plant-available.

A review of this literature, including the above article and other similar studies, and publications on soil conditions in California, concludes that metals toxicity and land productivity impacts would largely be limited to certain unique soil conditions in California (sandy, acidic, and with low organic matter content and low cation exchange capacities). This would impact certain metals-sensitive crops such as lettuce. This issue, was thoroughly and adequately discussed in the draft EIR, led to the conclusion that potentially significant impacts could occur in certain situations. Mitigation Measure 4-1 was developed to offset this potential impact.

Please note that the Pre-Application Report included at the end of the proposed GO (Appendix A) requires a fairly complete characterization of soil conditions, including soil pH and cation exchange capacity. Mitigation Measure 4-1 recognizes the potential impact on land productivity in certain soil conditions and places limitations on biosolids applications or crop choice on these sites. This mitigation measure is adequate as written to address this issue. (Please see the Response to Comment 26-28 for recommended revisions to Mitigation Measure 4-1.)

21-58. Because the proposed GO is a statewide program and conditions in California vary significantly, the EIR that has been prepared is necessarily programmatic in nature. The goal of the proposed GO and its EIR is to provide regulatory control and environmental evaluation only for those existing or proposed land application operations that can fully comply with the biosolids quality, site physical characteristics and site management conditions prescribed in the proposed GO. The programmatic impact analysis is sufficient to provide decision makers with the necessary environmental evaluation to support an action on a permit request that meets all these parameters. A checklist will be used by RWQCB staff to determine if specific projects are subject to requirements of the GO. If proposed projects deviate from the conditions in the proposed GO and the EIR, the RWQCBs will require that the applicant pursue individual waste discharge requirements and undergo further CEQA review.

21-59. The SWRCB believes that the alternatives in the EIR gives decision makers a reasonable range of options to consider in compliance with CEQA. The SWRCB developed the alternatives by first predicting the types of impacts that might occur, should the proposed GO be implemented. These alternatives were presented to the public through the scoping process to determine if other feasible alternatives exist that would reduce the proposed GO's potentially significant adverse effects. The Modified Provisions and Specifications Alternative and the Land Application Ban Alternative are clearly capable of mitigating or eliminating the identified potentially significant adverse effects; the alternatives proposed by the commenter would also address some of the potentially adverse effects, primarily those associated with public health risk. But it is felt that the mitigation measures proposed for the GO and the existing alternatives provide sufficient opportunities for the decision maker to consider ways to avoid or minimize the potential adverse effects of the project.

The last alternative suggested by the commenter (separation of food processing sludges from other organic sludges) would address only a small portion of the material intended for regulation under the proposed GO. The intent of the proposed GO is to regulate any material meeting the definition of biosolids, and therefore, consideration of only food processing sludges would not meet the project's objectives.

21-60. Additional testing for other contaminants are not required because:

- # The levels of unregulated contaminants are at extremely low levels in biosolids.
- # Contaminants listed in comment were evaluated when developing the Part 503 regulations. The EPA determined, either through risk assessments of detected chemicals or elimination because of extremely low levels, that environmental risk did not warrant testing and restrictions.
- # Data indicates that the levels of contaminants are continually decreasing in biosolids due to the implementation of pretreatment programs.
- # EPA continually studies various pollutants in biosolids and will provide limits when there is sufficient information that a health risk exists.

21-61. The levels of radionuclides in biosolids have and will continue to be reviewed. Regulatory responsibilities are shared by federal, state, and local agencies.

The Nuclear Regulatory Commission (NRC) issues permits for disposal of radioactive materials in the sewer system. Concentrations and quantities of radionuclides are based on a dose limit that could be received by an individual member of the public, assuming certain conservative conditions in calculating the potential dose.

Another source of protection from radioactivity is the EPA Producer of Toxic Waste (POTW) "pretreatment" program under the Safe Drinking Water Act. This program is designed to protect POTWs by preventing the introduction of pollutants (including radionuclides) into sewer systems that would interfere with the operation of a POTW, including interference with its use or disposal of sewage sludge.

In response to the request by John Glenn, the General Accounting Office (GOA) published the report, "Actions Needed to Control Radioactive Contamination at Sewage Treatment Plants." in May 1994. The report included a recommendation that NRC determine the extent of the contamination and establish limits for radionuclide levels.

Radioactivity in sewage sludge has also been examined by the EPA. The EPA report "Radioactivity in Sewage Sludge" stated that most radionuclides in sewage sludge were present at low concentrations. At most sites, sewage sludge contained radionuclides from

medical treatment and research facilities. Because of their short half-lives, the medical contaminants were found to not produce a significant dose when sludge was land-applied

Requiring rigorous testing for radionuclides in biosolids is not necessary because POTWs do test biosolids for radioactivity to protect its own workers from radioactive exposure. NRC has developed a guidance document for POTWs for sampling and testing of biosolids for radioactivity.

Ongoing testing by the NRC and EPA is occurring at sites with the highest potential for contamination. This effort is expected to confirm previous testing, which found the levels of radionuclides in biosolids contribute insignificantly to background radiation levels.

21-62. Under the proposed GO, groundwater monitoring is required when biosolids are land applied more then twice in a 5-year period when depth to groundwater is less than 25 feet. The RWQCB Executive Officer also has the authority to require additional monitoring if deemed necessary for site-specific reasons. This monitoring is considered adequate to protect public health because of the proposed GO's other required precautions, including sludge treatment before land application and setbacks from domestic water supply wells (the setback is greater than that required for septic tanks).

21-63. The proposed GO already precludes application of biosolids on slopes steeper than 10%, unless an erosion and sediment control plan is prepared by a qualified professional, as described in the GO. The erosion control plan shall describe the site conditions that justify application of biosolids to the steeper slopes and shall specify the application and management practices necessary to ensure containment of the biosolids on the application site and to prevent soil erosion. The proposed GO also does not permit biosolids applications in areas subject to gully erosion. Further, the proposed GO precludes application of biosolids to water-saturated ground and during periods of rain sufficient to cause runoff to leave the application site. The proposed GO requires groundwater monitoring when biosolids would be applied in coarse-textured soils in which groundwater is less than 25 feet below the surface. Although the commenter is correct in that coarse-textured soils may allow relatively rapid movement of leachate to groundwater, 25 feet of soil thickness is considered adequate to protect the groundwater from biosolid-derived pollutants. The Cornell Waste Management Institute's recommendations are effectively included in the proposed GO.

21-64. The commenter recommends incorporating the recommendations of the Cornell Waste Management Institute study (Cornell Waste Management Institute 1999) into the GO requirements. These include considering expanding pathogen testing to include fecal coliform and salmonella, and require non-detection of salmonella for Class A sludge (page 34).

Comment noted. SWRCB staff has relied on the testing requirements specified in the Part 503 regulations to meet the definitions for Class A and Class B biosolids with exception

to Salmonella testing. If EPA testing requirements change or more restrictive mandates are developed, then the SWRCB can consider amending the proposed GO to incorporate such requirements.

21-65. The CWMI comments are, in several parts, oriented at conditions in the northeastern United States, where importing of biosolids is a very real issue. However, from a conceptual standpoint, biosolids derived from out of state are applicable under the proposed GO. Such cases are not believed to be an issue since the U.S. EPA's risk-based standards are derived from the National Sewage Sludge Survey. Also, other than highly treated agricultural products, biosolids management in California is mostly internal with some export to other states. Thus, the EIR is addressing reasonably anticipated land applications of biosolids under the proposed GO.

21-66. This comment refers to a CWMI recommendation regarding application of Class B sludges. The proposed GO provides a conservative approach to regulating Class B biosolids, with setback requirements, storage and application timing controls, and restrictions on the timing of growing crops or introducing grazing animals at application sites. The ecological and animal health effects have been thoroughly reviewed in this EIR (see Chapters 4, 5 and 7). A consideration of necessity has not been included in the proposed GO and is not considered appropriate.

21-67a. Regulation of Exceptional Quality biosolids by the proposed GO should not be viewed as an exemption. Such applications not applicable to the proposed GO may be issued individual waste discharge requirements, as determined on a case-by-case basis.

21-67b. Master Responses 13, 14, 15, 16 and 17 generally describe the basis for the analysis of potential surface and groundwater quality impacts in the EIR regarding EPA's risk assessments conducted for the Part 503 regulations, additional protective measures in the proposed GO, and the authority of RWQCB staff to use monitoring and professional judgement to determine if a specific biosolids application project will protect water quality. Biosolids application projects that qualify under one of the proposed GO's allowed exemptions for application rate or field size would continue to still be regulated by public health law and local ordinances. Any applications of the size and extent required for an exemption, given the requirement for EQ-level treatment, would be more conservative than application rates used for the Part 503 regulations risk assessments. Therefore, the master responses listed above provide the basis for evaluating the potential water quality impacts of those exemptions. The analysis in the EIR includes potential impacts of the entire GO program; individualized analyses of the listed exemptions to the proposed GO are not deemed necessary.

21-67c. Biosolids not subject to the proposed GO may be subject to other regulatory processes, such as California Department of Food and Agriculture labeling requirements and individual WDRs. The description of all potential regulatory processes, including the application process for a waiver or individual waste discharge requirement, is not relevant

to the impact analysis in this EIR. These are existing processes not affected by the proposed GO.

21-68. There have been few studies of the concentrations of viable cryptosporidia oocysts in biosolids. As stated on draft EIR pages E-11 through E-14, no outbreaks of the disease have been associated with biosolids to date. Flooding of pastures where cattle graze has been a source of cryptosporidium when downstream water treatment facilities have operated at maximum efficiency. A great deal of research and upgrading of facilities has been underway to protect public water supplies from the potential presence of cryptosporidium and giardia, two protozoans which have been emerging pathogens of concern.

Research indicates that the protozoan parasites are largely killed during anaerobic sludge digestion. They do occur in large numbers in anaerobically digested sludge, but previous testing methods could not assess long-term viability. New methods can assess the viability of these organisms, but these methods have not yet been applied to biosolids. The parasites are unlikely to survive longer than enteric bacteria or viral pathogens in the biosolids after land application (Dr. Charles Gerba pers. comm.). They are inactivated rapidly at warm temperatures and under low moisture conditions.

21-69. See Master Response 6.

21-70. For concerns about enforcement, see Master Response 1. Many generators are also dischargers and are therefore covered by the proposed GO. There are numerous federal, state, and regional regulations applicable to generators that are not part of the proposed GO. These include: sewage sludge regulations (40 CFR Part 503), landfill requirements (40 CFR Parts 257 and 258), the Clean Air Act, and the Resource Conservation and Recovery Act. Furthermore, the biosolids must meet the requirements of the proposed GO, regardless of whether the generator or discharger is responsible.

21-71. See Master Response 1.

21-72. The National Sewage Sludge Survey has documented the quality of sewage sludge on a national level. This information, combined with data submitted during the GO application process, sufficiently characterizes the material proposed for land application. All testing must be performed by a Department of Health Services-certified laboratory. Such laboratories are subject to periodic Quality Control/Quality Assurance evaluations. Testing of biosolids, as required by the federal regulations, vary depending on the size of the wastewater treatment plant. Seasonal fluctuations that would cause a municipal sludge to be classified as a hazardous waste are not known to occur.

21-73. Finding 22 of the proposed GO has been modified to read "Environmental Impact Report" instead of ~~Mitigated Environmental Impact Report.~~

21-74. As described in Master Response 14, the EIR does not regard groundwater monitoring as mitigation for potential impacts. Similarly, surface water quality monitoring would not reduce potential surface water quality impacts. SWRCB staff believes surface water quality monitoring at all biosolids application sites is not necessary. SWRCB staff reserves the right to require monitoring if there is any indication that contamination may be occurring. This monitoring could be conducted by the SWRCB staff, by staff at each RWQCB, or the GO program could be amended to require individual application projects to conduct surface water quality monitoring.

21-75. Provision No. 15 in the proposed GO allows for the RWQCB to enter the site and sample for substances or parameters to evaluate compliance. Enforcement of all waste discharge requirements, with listed penalties, may be found in Chapter 5 of the California Water Code.

21-76. The 30-day requirement is established from the "Technical Support Document for Reduction of Pathogens Vector Attraction in Sewage Sludge" by Eastern Research Group for the United States Environmental Protection Agency, Document No. PB93110609, p. 2-11 to 2-15, 1992. The 33-foot filter strip requirement was taken from "Soil and Water Conservation for Productivity and Environmental Protection" by Frederick R. Troeh, Prentice-Hall Inc., Englewood Cliffs, N.J., 07632, p. 263 to 264, 1980. The controls established in those documents were subjected to technical review and are considered effective.

21-77. In most cases, biosolids must undergo testing to show that it is not hazardous waste. The testing is based on CCR Title 22, Division 4.5, Chapter 11 requirements (Identification and Listing of Hazardous Waste). The requirements contain an extensive list of pollutants for which biosolids must be tested. The public has access to all testing results. This requirement is clearly stated in the proposed GO (Prohibition 11).

Only after the biosolids have passed all the tests in the requirements can the material be considered for land application under the proposed GO. A preapplication report, which lists additional testing results that must be reported, must be filed with the RWQCB. Testing of individual truckloads of biosolids would be very costly and the need is not supported by existing data on municipal sludge quality. Pretreatment programs and periodic sludge quality testing are designed to avoid the presence of pollutants at hazardous levels in sludge destined for land application.

21-78. See Response to Comment 21-77.

21-79. Saturated soil at the point of application is where the biosolids and soil interface. This is usually at the surface of the soil.

21-80. This prohibition has been revised to be less subjective. The text of the proposed GO, as found in Prohibition No. 15 of Appendix A, now reads as follows:

The application of biosolids in areas where biosolids are subject to gully erosion or washout offsite is prohibited.

There is no evidence that the prohibitions in this comment are needed to fully protect public health and water quality.

21-81. See Master Response 6.

21-82. Class B biosolids receive less treatment for potential pathogens and therefore have a higher probability to contain significantly higher pathogens. Accordingly, discharges from such sites have more potential for adverse effects off site and therefore require more precaution when land-applied.

21-83. See Master Response 3.

21-84. The Executive Officer is supported by RWQCB staff, which can include registered civil engineers, certified geologists, certified engineering geologists, and certified hydrogeologists specializing in water quality issues. As specified in the proposed GO in Appendix A of the draft EIR and the final EIR, the setback cannot be less than 100 feet. This is the setback specified for domestic wells from animal or fowl enclosures as specified in the Water Well Standards: State of California, Bulletin 74-81.

21-85. The commenter states that the EIR should include more information on biosolids storage facilities. The storage areas in question are only intended for use for less than 7 days and that storage facilities are required to be covered within 24 hours. The GO requires a cover to be maintained until applied.

21-86. See Responses to Comments 14-3, 14-5 and 14-17.

21-87. As part of the proposed mitigation for this project, Mitigation Measure 4-3 would require the state to track and identify biosolids application sites. The system and its records would be kept indefinitely and would be available to prospective land buyers.

21-88. The Pre-Application Report requires a map that shows the surrounding area, including wells. USGS maps and Department of Water Resources records usually include known historical wells. As such, further elaboration is believed unnecessary.

21-89. The character of biosolids coming from a particular source does not differ significantly, so testing every truck is unwarranted. Testing frequencies are established in federal regulations and vary with the size of the wastewater treatment plant. The proposed GO requires that data to be submitted to the RWQCB. See Responses to Comments 21-75 and 21-77.

21-90. The necessity of this requirement is unsubstantiated in the comment and not believed to be necessary to protect the environment.

21-91. The validity of tracking pollutants in the soil is deemed to have little benefit, and is an unnecessary cost to the citizens and dischargers that accept biosolids. The EPA risk assessment established cumulative pollutant loading rates based on additions of biosolids to the soil. The state is proposing a similar program. As such, tracking of pollutants in the soil does not measure compliance. Pathogens are not deemed to persist. Other pollutants are not expected to be significant.

21-92. The need to require surface water monitoring by individual farmers who use biosolids is not justified by the findings of the EIR. It is acknowledged that such monitoring would add to the knowledge bases regarding this material and the water quality impacts from use of fertilizers as a whole. However, the need for individual farmers to monitor their tailwater, runoff, and tilewater solely because of the use of biosolids is not justified given the controls contained in the proposed GO.

21-93. The reference to "Category b" in the last sentence of the third paragraph on page ES-7 is correct.

21-94. See Master Responses 7 and 8 for a full discussion of these restrictions on reentry.

The text of Mitigation Measures 4-2 and 5-2 are apparently confusing. In response, the second sentence of each mitigation measure is revised as follows:

> The proposed GO should also be revised to ~~prohibit grazing animals from using a site~~ require that grazing of animals be deferred for at least 60 days after.....

This same text change has been made in Table 15-1.

21-95. Comment noted; the second sentence of the last paragraph on p. 5-34 is amended as follows:

> The proposed GO contains sufficient provisions to prevent such occurrences (setbacks, minimum distances to wells, ~~minimum depth to groundwater,~~ runoff controls, and prohibitions to long-term storage piles where concentrations of pathogens might be higher if leached to groundwater.

21-96. See Master Response 13 and Response to Comment 21-8.

21-97. Table 15-1, "Mitigation Monitoring Program" has been revised and is included as Appendix C of this document.

21-98. The commenter stated that the EIR failed to provide public agencies and the public with detailed information about the effect of the proposed project, failed to provide mitigation measures to reduce significant impacts, and did not adequately analyze alternatives. The SWRCB does not agree with the commenter's opinion. The EIR was prepared with a sufficient degree of analysis to provide the decision makers with information while enables them to intelligently take account of environmental consequences when making the decision whether to approve the project. SWRCB staff prepared this EIR in good faith and with full public disclosure. A team of qualified individuals developed the EIR and conducted peer review of the analysis. SWRCB staff worked closely with the technical consultants and independently reviewed the entire EIR. Public scoping meetings were conducted to solicit comments from the public regarding the proposed GO, public hearings were held to inform the public and agencies of the potential environmental impacts of implementing the proposed GO, and alternatives consistent with the State CEQA Guidelines were evaluated.